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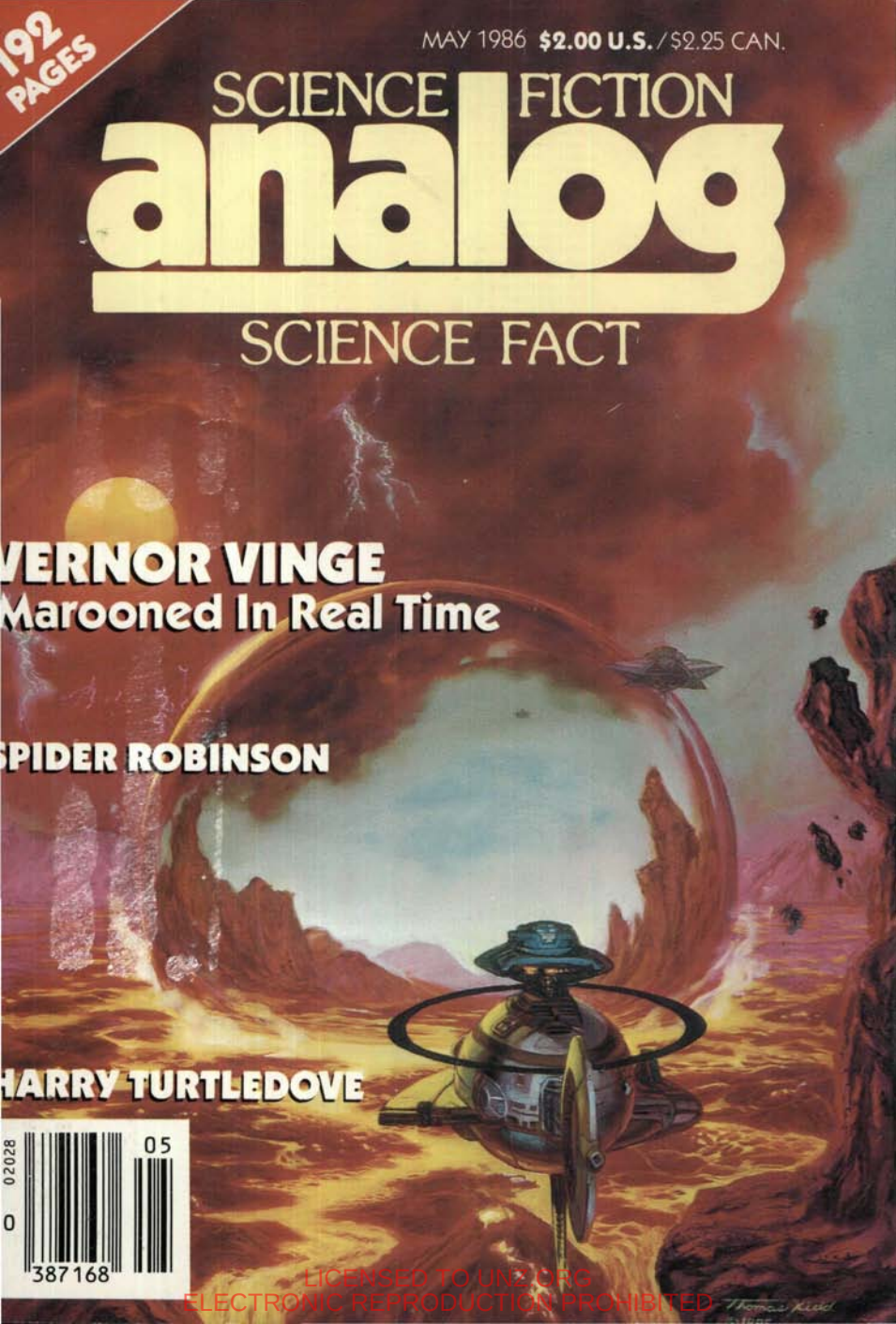

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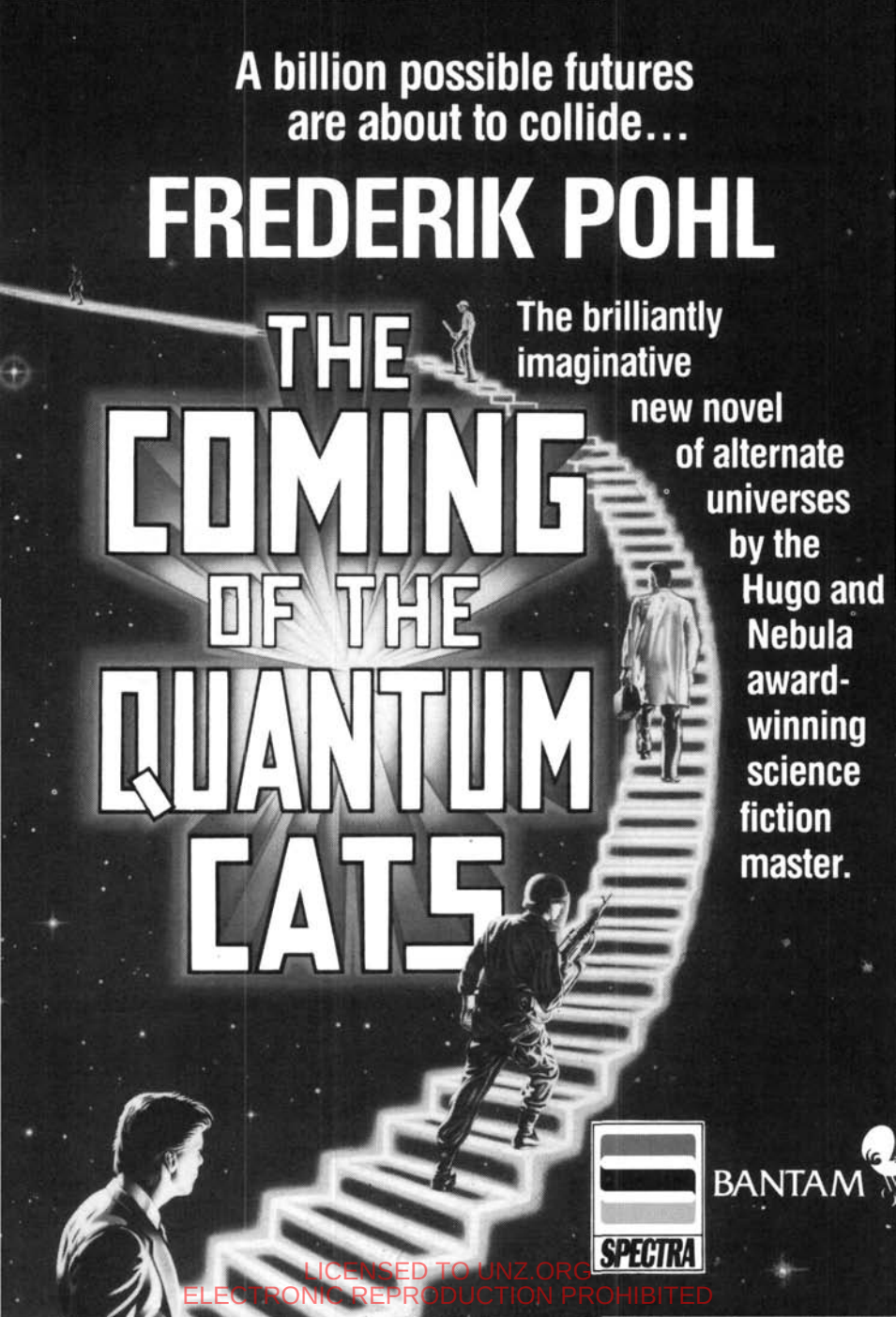

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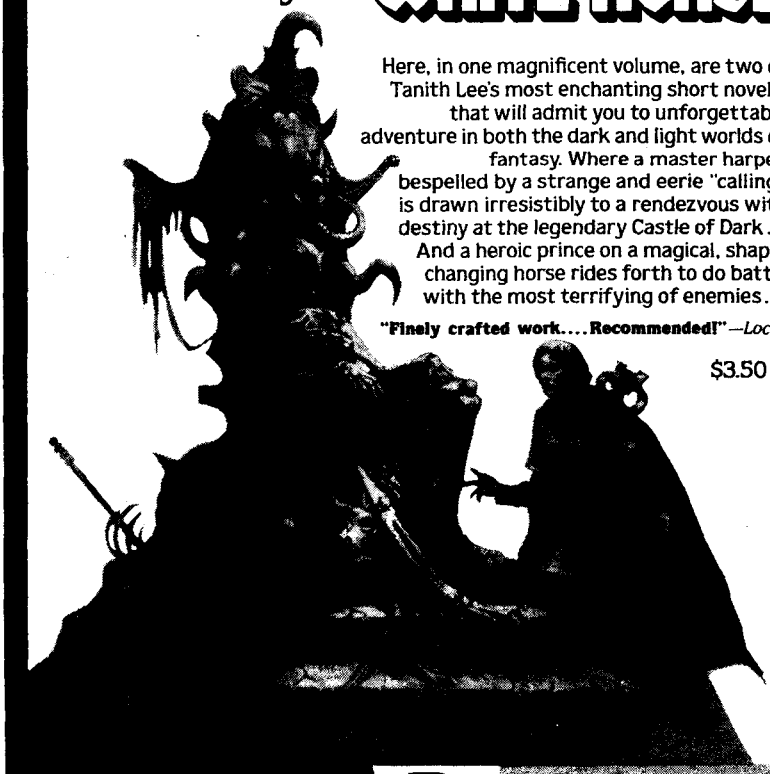

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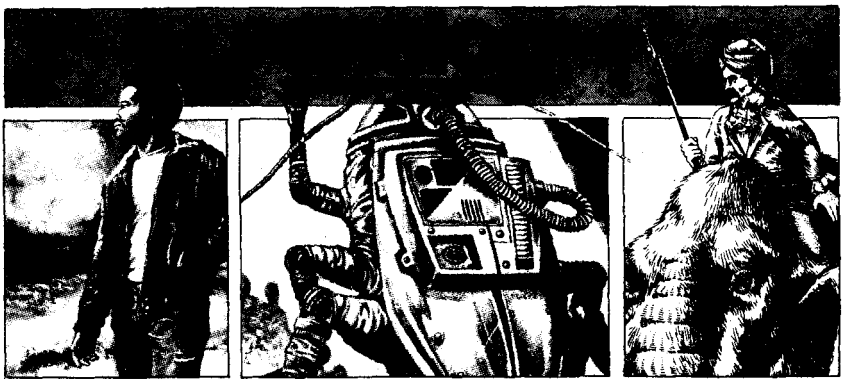

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Editorial

THE PANIC MENTALITY

Stanley Schmidt

One of the first editorials I wrote for this magazine ("Safety First," October 1979) dealt with what I saw as a disease of our culture: an obsession with safety at all costs. The symptoms I cited then included demands for the immediate shutdown of all nuclear reactors because one of them had a relatively severe (though nonfatal) accident, and the actual grounding of an entire species of aircraft because one plane of that type crashed. I haven't had any cause to change my diagnosis, but recently a number of other incidents have made me realize that those symptoms reflect another malady as well—one so closely related that it's sometimes hard to tell where one ends and the other begins, but nevertheless worthy of scrutiny and treatment in its own right.

Not long ago, not far from where I live, a boy died in a school bus accident. He was not wearing a seat belt; the school district involved had earlier decided not to require them for school bus passengers, partly because of studies which indicated that *under the special circumstances prevailing on school buses* seat belts did not significantly improve safety and in fact might have the opposite effect. But as soon as one local passenger died in an accident, parents throughout the area were up in arms demanding the immediate installation and compulsory use of seat belts on all seats of all school buses. *Not* immediate better studies to establish once and for all what, if any, advantage or disadvantage such a measure would have, but immediate *action*. Now, it's perfectly understandable that they were upset over the death, and it may well be that a really good study would confirm that what they're demanding really is the best thing to do—but that's not the point. The point is that nobody's sure, so far; yet one incident made these peo-

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ple *feel* sure that they knew what was needed. In private automobiles, seat belts are often helpful and occasionally harmful. There's no easy way to predict which way things will go in a particular accident, but it seems pretty well established that statistically they're so much more likely to protect than injure that in general it's a good idea to use them. It's not at all obvious that the odds come out the same way in a school bus, where a large number of younger and generally less responsible people are arranged quite differently in a much larger vehicle. If they don't, a well-meant measure based on an emotional reaction to a single incident might turn out to hurt more people than it helps in future accidents.

Also not long ago, the New York area experienced an earthquake measuring 4.0 on the Richter scale—the level characterized by "perceptible swaying and rumbling," but little or no damage. I know what it feels like, having experienced aftershocks as strong as 4.5 after the big quake in Guatemala in 1976. (I more or less slept through this one, though it woke three other people in my house quickly enough for them to recognize what was happening.) An earthquake of that magnitude is a moderately interesting experience, but not much more than that—or at least it *shouldn't* be much more than that. Yet immediately and for several hours thereafter, phone lines were jammed with callers fearful that the nearest nuclear power plant had exploded. The next editions of local newspapers were full of "man-on-the-street" quotes from people saying things like, "I just kept praying that it would stop, and thank God it did," and "All we could think of was getting out of the house." All those calls and all that fear were quite unnecessary, and must have looked like wild overreaction to anyone even slightly familiar with the geological makeup and history of this region or the nonexplosive nature and heavily earthquake-protected construction of nuclear plants.

I believe it was earlier this year that a study group recommended that people not eat more than a specified amount per month of fish from a major eastern river, because of the presence of certain contaminants which might be ingested in toxic quantities if too much local fish were eaten. The mayor of a large city on the river evidently lacked the concept of toxic versus nontoxic quantities; he promptly seized the opportunity to proclaim that he didn't think people should eat anything which could be toxic in *any* quantity. I have news for Hizzoner: virtually *anything* can be unhealthy in *some* amount, and sometimes it's *necessary* to ingest a small quantity of something which would be dangerous in large doses. Medicines are the obvious example, but it's also true of at least most nutrients. "Toxins" just have lower thresholds. Once you understand that fact, it seems as foolish to worry about harmless quantities of things as to expose yourself to dangerous amounts. Much as it might reduce the labor of thinking, and desirable as some might find that goal, the real world does not consist entirely of blacks and whites, yesses and nos.

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What all my examples, old and new, have in common is that in each case people have—unnecessarily—reacted to a single incident or a small quantity of something in an emotional rather than a rational way. In each case they have treated a small or particular instance as if it were large and general, plunging into a course of action without due regard for its actual future efficacy or even its present appropriateness in view of the actual severity of the situation. The fact that one person died in a bus accident does not automatically mean that even he would have been better off with a seat belt, much less that everyone would if they all wore them in the future. (Please note: I'm not saying that they *wouldn't*, but only that the question hasn't been settled yet.) Someone who lives near a nuclear plant and in a region susceptible to occasional minor tremors (but highly unlikely to have major earthquakes) could have learned enough about those things beforehand to recognize that a moderate tremor in such a place is no cause for serious alarm. Anyone concerned about environmental poisoning can learn enough about threshold effects and the behavior of the toxin in question to *evaluate* the danger posed by a particular exposure rather than just assuming that Any Is Bad.

The current epidemic fear of AIDS is a little different, but only a little. It's true that much is still not known about this disease, including how to cure it. But some things *are* known about it, and many of those participating in the panic could sleep a lot easier if they paid attention to those. They would learn, for example, that screening for the AIDS virus has progressed to the point where there is little or no danger of getting it from a blood transfusion—and there never was any danger of getting it from *giving* blood, because all the collecting is done with sterile instruments and containers.

The kinds of reactions I've been observing are the product of something more like reflex than thought. Reflex and instinct—"preprogrammed" actions carried out with little or no conscious thought—are highly valuable, in their place. That place is when an individual is already in a situation which demands immediate action and does not allow time for pondering. I might be short an eye if I had had to think about whether to close it when a radiator hose exploded nearby. But if I am deciding whether to cross the street in front of an oncoming car, I can think about how far away it is and how fast it's moving and decide whether the risk is reasonable. The advantage of intelligence is that it can override instinct when instinct is wrong, and make reflex unnecessary when there is time to evaluate a potentially dangerous situation before getting into it. The school bus driver may have to rely on conditioned reflexes in a real-time pinch, but the people setting policy for dealing with such emergencies in the future can—and should—do better. People living where earthquakes are possible can learn *before* one happens what intensities are likely, how to recognize them, and what (if anything) to do about them. People faced with *any* long-term danger can make a reasonable

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effort to evaluate its severity and act accordingly rather than reacting to the mere whisper of its name as if it were the worst possible reality.

Why do we see so many knee-jerk overreactions and so few well considered and measured responses? And is that any more true now than in times past? I'm not sure, of course, and it's difficult to make direct comparisons. Certainly there has been plenty of irrationality throughout history, but it seems to me that, even if irrationality hasn't actually increased, neither has it decreased as much as the growth of available knowledge might lead one to expect—and I think I have at least a partial idea of the reason. My hunch is that modern people in highly developed countries often react with unnecessary panic because they are so unaccustomed to real emergencies, and conditioned so full of vaguely imagined fears of things that *might* happen, that they find it difficult to tell which is which. But they *can* do something about that; and the sooner they do, the better. ■

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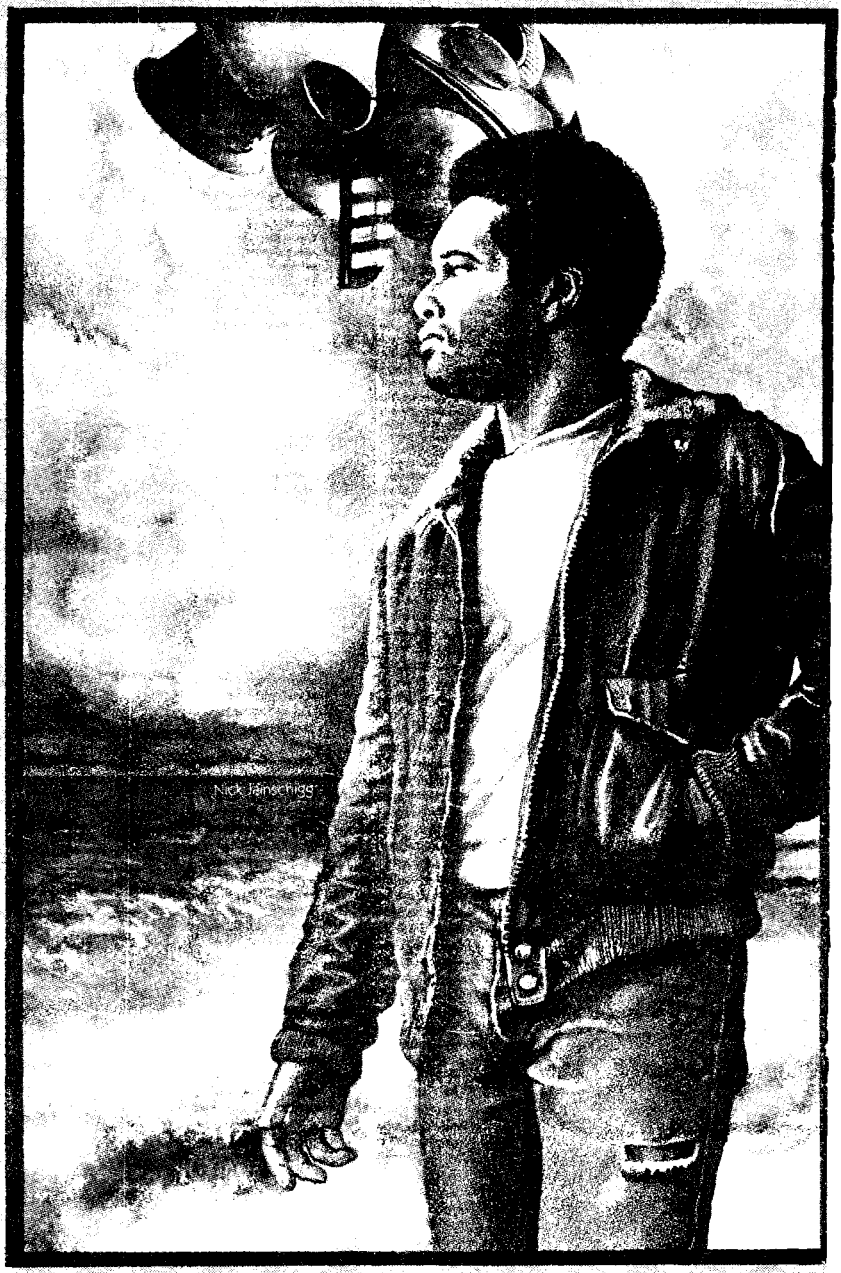

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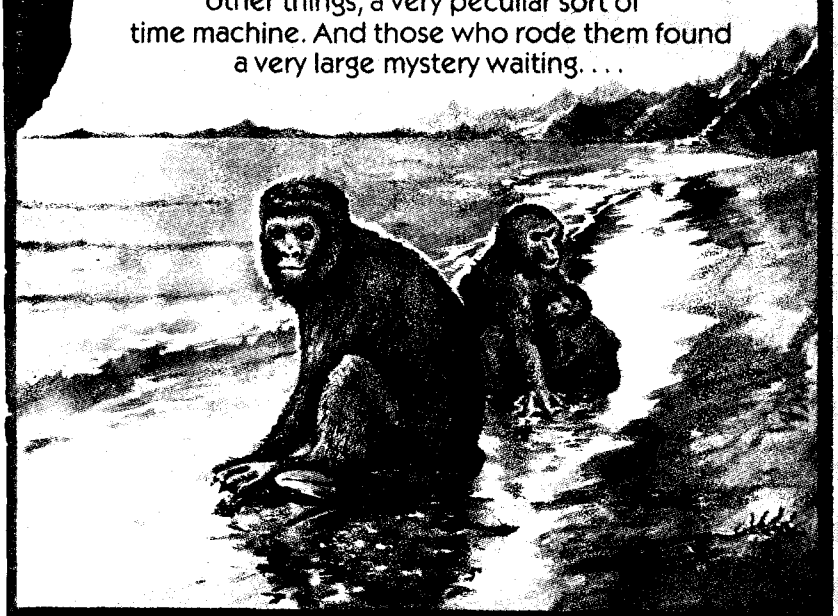
Part One of Four

Vernor Vinge

MAROONED IN REAL TIME

Bobbles were, among other things, a very peculiar sort of time machine. And those who rode them found a very large mystery waiting. . . .



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On the day of the big rescue, Wil Brierson took a walk on the beach. Surely this was one afternoon when it would be totally empty.

The sky was clear, but the usual sea mist kept visibility to a few kilometers. The beach, the low dunes, the sea—all were closed in by faint haze that seemed centered on his viewpoint. Wil moped along just beyond the waves, where the water soaked the sand flat and cool. His *ninety-kilo tread left perfect barefoot* images trailing behind. Wil ignored the sea birds that skirled about. He walked head down, watching the water ooze up around his toes at every step. A humid breeze carried the smell of seaweed, sharp and pleasant. Every half minute the waves peaked and clear sea water flooded around his ankles. Except for storms, this was all the "surf" one ever saw on the Inland Sea. Walking like this, he could almost imagine that he was back by Lake Michigan, so long ago. Every summer, he and Virginia had camped on the lakeshore. Almost, he could imagine that he was returning from a noontime stroll on some very muggy Michigan day, and that if he walked far enough he would find Virginia and Anne and Billy waiting impatiently around the campfire, teasing him for going off alone.

Almost . . .

Wil looked up. Thirty meters farther on was the cause of all the sea bird clamor. A tribe of fishermonkeys were playing at water's edge. The monkeys must have noticed him by now. In past weeks, they would have disappeared into the sea at the first sight of human or machine. Now they stayed ashore. As he approached, the younger ones waddled toward him. Wil went to one knee and they crowded round, their webbed fingers searching curiously at his pockets. One removed a data card. Wil grinned, tugged the card from monkey's grasp. "Aha! A pickpocket. You're under arrest!"

"Forever the policeman, eh, Inspector?" The voice was feminine, the tone light. It came from somewhere over his head. Wil leaned back: A remote-controlled *flier hung just a few meters* above him.

He grinned. "Just keeping in practice. Is that you, Marta? I thought you were preparing for this evening's 'festivities.' "

"I am. And part of the preparation is to get foolish people off the beach. The fireworks won't wait till night."

"What?"

"That Steve Fraley—he's making a big scene, trying to argue Yelén into postponing the rescue. She's decided to do it a little early, just to let Steve know who's boss." Marta laughed. Wil couldn't tell if her amusement was directed at Yelén Korolev's irritation or at Fraley. "So please to move your tail, sir. I have some other people to harass yet. I expect you back in town before this flier."

"Yes, Ma'am!" Wil gave a mock salute and turned to jog back the way he came. He had gone about thirty meters when a banshee shriek erupted behind him. He glanced over his shoulder and saw the flier diving in the other direction, lights flashing, sirens blaring. Against that assault, the new-found sophistication of the fishermonkeys dissolved. They panicked, and with the

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screaming flier between them and the sea their only choice was to grab the kids and scramble up into the dunes. Marta's flier followed, dropping noise bombs on either side of them. Flier and monkeys disappeared over the top of the sand into the jungle, and the noise faded. Wil wondered briefly how far Marta would have to chase them to get them into a safe area. He knew she was equal parts soft-heartedness and practicality. She'd never scare the animals away from the beach unless there was some chance they could make it to safe haven. Wil smiled to himself. He wouldn't be surprised if Marta had chosen the season and the day of the blow-off to minimize deaths to wildlife.

Three minutes later, Wil Brierson was near the top of the rickety stairs that led to the monorail. He looked down and saw that he hadn't been the only person on the beach. Someone was strolling toward the base of the stairway. Over half a million centuries, the Korolevs had rescued or recruited quite a collection of weirds, but at least they all *looked* fairly normal. This . . . person . . . was different. The stranger carried a variable parasol, and was naked except for a loin cloth and shoulder purse. His skin was pale, pasty. As he started up the stairs, the parasol tilted back to reveal a hairless, egglike head. And Wil saw that the stranger might just as well be a she (or an it). The creature was short and slender, its movements delicate. There were faint swellings around its nipples.

Brierson waved hesitantly; it was good policy to meet all the new neighbors, especially the advanced travelers. But then it looked up at Brierson, and even across twenty meters those dark eyes penetrated with cold indifference. The small mouth twitched, but no words came. Wil swallowed, and turned to continue up the plastic stairs. There might be some neighbors it was better to learn of second-hand.

Korolev. That was the official name of the town (as officially named by Yelén Korolev). There were almost as many rival names as there were inhabitants. Wil's Indian friends wanted to call it Newest Delhi. The government (in irrevocable exile) of New Mexico wanted to call it New Albuquerque. Optimists liked "Second Chance," pessimists "Last Chance." For megalomaniacs it was "The Great Urb."

Whatever its name, the town was nestled in the foothills of the Indonesian Alps, high enough so that equatorial heat and humidity were moderated to an almost uniform pleasantness. Here the Korolevs and their friends had finally assembled the rescued from all the ages. Almost everyone's architectural taste had been catered to: The New Mexican statists had a main street lined with large (mostly empty) buildings that Wil thought epitomized their bureaucracy. Most others from the twenty-first century—Wil included—lived in small groups of homes very like those they'd known before. The advanced travelers lived higher in the mountains.

Town Korolev was built on a scale to accommodate thousands. At the moment the population was less than two hundred, every living human being. They needed more; Yelén Korolev knew where to get one hundred more. She was determined to rescue them.

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Steven Fraley, President of the Republic of New Mexico, was determined that those hundred remain unrescued. He was still arguing the case when Brierson arrived: "—and you don't appreciate the history of our era, Madam. The Peacers came near to exterminating the human race. Sure, saving this group will get you a few more warm bodies, but you risk the survival of our whole colony, of the entire human race, in doing so."

Yelén Korolev looked calm, but Wil knew her well enough to recognize the signs of an impending explosion: There were rosy patches on her cheeks, though her features were otherwise even paler than usual. She ran a hand through her blond hair. "Mr. Fraley, I really do know the history of your era. Remember that almost all of us—no matter what our present age and experience—have our childhoods within a couple hundred years of one another. The Peace Authority," her lips twitched in a quick smile at the name, "may have started the general war of 1997. They may even be responsible for the terrible plagues of the early twenty-first century. But as governments go, they were relatively benign. This group in Kampuchea," she waved toward the north, "went into stasis in 2048, when the Peacers were otherthrown. That was before decent health care was available. It's entirely possible that none of the original criminals is present."

Fraley opened and closed his mouth, but no words came. Finally, "Haven't you heard of their 'Renaissance' scheme? In '48 they were ready to kill by the millions again. Those guys under Kampuchea probably got more hell-bombs than a dog has fleas. That base was their secret ace-in-the-hole. If they hadn't screwed up their stasis, they'd've come out in 2100 and blown us away. And you probably wouldn't even have been born—"

Yelén cut into the torrent. "Hell-bombs? Popguns. Even you know that. Mr. Fraley, getting another hundred people into our colony will make our settlement just big enough to survive. Marta and I haven't spent most of our lives setting this up just to see it die off like the undermanned attempts of the past. The only reason we postponed the founding of Korolev till megayear fifty was so we could rescue those Peacers when their bobble bursts."

She turned to her partner. "Is everybody accounted for?"

Marta Korolev had sat through the argument in silence, her dark features relaxed, her eyes closed. Her headband put her in communication with the estate's autonomous devices. No doubt she had managed a half-dozen fliers during the last half hour, scouring the countryside for any truant colonists the Korolev satellites had spotted. Now she opened her eyes. "Everybody's accounted for and safe. In fact," she caught sight of Wil standing at the back of the amphitheater and grinned, "almost everyone is here on the castle grounds. I think we can provide you people with quite a show this afternoon." She either hadn't followed or—more likely—had chosen to ignore the dispute between Yelén and Fraley.

"Okay, let's get started." A rustle of anticipation passed through the audience. Many were from the twenty-first century, like Wil. But they'd seen

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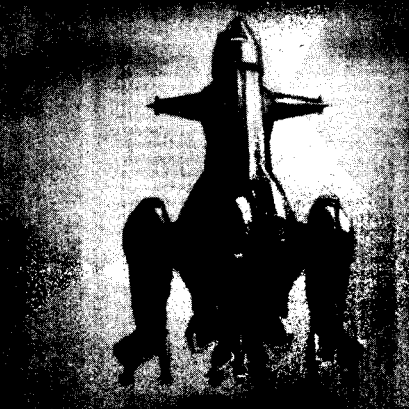

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enough of the advanced travelers to know that such a statement was more than enough signal for spectacular events to happen.

From his place at the top of the amphitheater, Wil had a good view to the north. The forests of the higher elevations fell away to a gray-green blur that was the equatorial jungle. Beyond that, haze obscured even the existence of the Inland Sea. Even on the rare, clear day when the sea mists lifted, the Kampuchean Alps were hidden beyond the horizon. Nevertheless, the rescue should be visible; he ws a bit surprised that the bluish-white of the northern horizon was undisturbed.

"Things will get more exciting, I promise." Yelén's voice brought his eyes back to the stage. Two large displays floated behind her. They made an incongruous contrast with the moss- and gold-encrusted temple that covered the land beyond the stage. Castle Korolev was typical of the flamboyance of the advanced residences. The underlying stonework and estuary—modeled vaguely on Angkor Wat—had been built half a thousand years earlier, then left for mountain rains to wear at, for moss to cover, for trees to penetrate. Afterwards, construction robots hid all the subtle machinery of late twenty-second century technology within the "ruins." Wil respected that technology. Here was a place where no sparrow could fall unremarked. The owners were as safe from a quiet knife in the back as from a ballistic missile attack.

"As Mr. Fraley says, the Peacer bobble was supposed to be a secret. It was originally underground. It is much farther underground now—somebody blundered. What was to be a fifty year jump became something . . . longer. As near as we can figure, their bobble should burst sometime in the next few thousand years. That's fifty million years in a single jump. During that time, continents drifted, new rifts formed. And parts of Kampuchea slid deep beneath new mountains." The display behind her lit with a multicolored transect of the Kampuchean Alps. The cool, solid crust appeared as blue, shading into yellow and orange at the greater depths. Right at the margin of orange and magma red was a tiny black disc—the Peacer bobble, afloat against the ceiling of hell.

Inside the bobble, time was stopped. Those within were as they'd been at that instant of a near-forgotten war when the losers decided to escape to the future. No force cold affect the bobble's contents; no force could affect its duration—not the heart of a star, not the heart of a lover.

But when the bobble burst, when the stasis ended . . . The Peacers were about forty kilometers down. There would be a moment of noise and heat and pain as the magma swallowed them. One hundred men and women would die, and a certain endangered species would move one more step toward final extinction.

The Korolevs proposed to raise the bobble to the surface, where it would be safe for the few remaining millenia of its duration. Yelén waved at the display. "This was taken just before we started the operation. Here's the ongoing view."

The picture flickered. The red magma boundary had risen thousands of meters

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above the bobble. Pinheads of white light flashed in the orange and yellow that represented the solid crust. In the place of each of those lights, red blossomed and spread, almost—Wil winced at the thought—like blood from a stab wound. "Each of those sparkles is a hundred megaton bomb. In the last few seconds, we've released more energy than all mankind's wars put together."

The red spread as the wounds coalesced into a vast hemorrhage in the bosom of Kampuchea. The magma was still twenty kilometers below ground level. The bombs were timed so there was a constant sparkling just above the highest level of red, bringing the melt closer and closer to the surface. At the bottom of the display, the Peacer bobble floated, serene and untouched. On this scale, its motion toward the surface was imperceptible.

Wil pulled his attention from the display and looked beyond the amphitheater. There was no change: the northern horizon was still haze and pale blue. The rescue site was fifteen hundred kilometers away, but even so, he'd expected something spectacular. The minutes passed. A cool breeze swept slowly around the theater, rustling the almost-jacarandas that bounded the stage, sending the perfume of their large flowers across the audience. A family of spiders in one tree had built a for-show web in its upper branches. The web silk gleamed in rainbow colors against the sky.

The elapsed-time clock on the display showed almost four minutes. The Korolev pattern of bomb bursts was still thousands of meters short of the surface.

President Fraley rose from his seat. "Madame Korolev, please. There is still time to stop this. I know you've rescued all types, cranks, joyriders, criminals, victims. But these are *monsters*." For once, Wil thought he heard sincerity—perhaps even fear—in the New Mexican's voice. *And he might be right*. If the rumors were true, if the Peacers had created the plagues of the early twenty-first century, then they were responsible for the deaths of billions. If they had succeeded with the Renaissance Project, they would have killed most of the survivors.

Yelén Korolev glanced down at Fraley, but didn't reply. The New Mexican stiffened, then waved abruptly to his people. One hundred men and women —most in NM fatigues—came quickly to their feet. It was a dramatic gesture, if nothing else: the amphitheater would be almost empty with them gone.

"Mr. President, I suggest you and the others sit back down." It was Marta Korolev. Her tone was as pleasant as ever, but the insult in the words brought a flush to Steve Fraley's face. He gestured angrily and turned to the stone steps that led from the theater.

Wil was more inclined to take her words literally: Yelén might use sarcasm and imperious authority, but Marta usually meant her advice only to help. He looked again to the north. Over the jungle slopes there was a wavering, a rippling. *Oops*. With sudden understanding, Wil slid onto a nearby bench.

The ground shock arrived an instant later. It was a soundless, rolling motion that took Fraley's feet right out from under him. Steve's lieutenants quickly helped him up, but the man was livid. He glared death at Marta, then stomped

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quickly—and carefully—up the steps. He didn't notice Wil till he was almost past him. The Republic of New Mexico kept a special place in its fecal pantheon for W.W. Brierson; having Wil witness this humiliation was the last straw. For an instant Wil thought the other was going to drive his clenched fists into Wil's face. Then the generals hustled their president on. Those who followed glared briefly at Brierson, or avoided looking at him entirely.

Their departing footsteps came clearly from beyond the amphitheater. Seconds later they had fired up the engines on their armored personnel carriers, and were rumbling off to their part of town. All through this, the earthquake continued. For someone who had grown up in Michigan, it was uncanny. The rolling, rocking motion was almost silent. But the birds were silent too, and the spiders on the for-show web motionless. From deep within the castle's stonework there was faint creaking.

On the transect, magma red had nearly reached the surface. The tiny lights that represented bombs flickered just below ground, and the last yellow of solid earth just . . . evaporated.

Still the nuking continued, carving a wide red sea.

And finally there was action on the northern horizon. Finally there was direct evidence of the cataclysm there. The pale blue was lit again and again by something very bright, something that punched through the haze like a sunrise trying to happen. Just above the flashes a band of white, almost like a second horizon, slowly rose. The top had been blown off the northern foothills of the Kampuchean Alps.

A sigh spread through the audience. Wil looked down, saw several people pointing upward. Faintly purple, barely brighter than the sky, the wraith extended almost straight overhead from north to south. A daytime aurora?

Strange lightning flickered on the slopes below the castle. The air in the amphitheater was charged with static electricity, yet still unholy silent. The sound of the rescue would come loud even from fifteen hundred kilometers around the earth, but that sound was still an hour away, chugging across the Kampuchean Alps toward the Inland Sea.

And the Peacer bobble, like flotsam loosed from ice by a summer sun, was free to float to the surface.

2

Everyone agreed with Marta that the show had been impressive. Many didn't realize that the "show" wouldn't end with one afternoon of fireworks. The curtain calls would go on for a some time, much more dismal than impressive.

The rescue blasting had been about a hundred times as energetic as the nineteenth century Krakatoa blow-off. Billions of tonnes of ash and rock were pumped into the stratosphere that afternoon. The sun was a rare sight in the days that followed, at best a dim reddish disk through the murk. In Korolev, there was a heavy frost on the ground every morning. The almost-jacarandas were wilted and dying. Their spider families were dead or moved to burrows. Even in the jungles along the coast, temperatures rarely got above 14 degrees now.

It rained most of every day—but not

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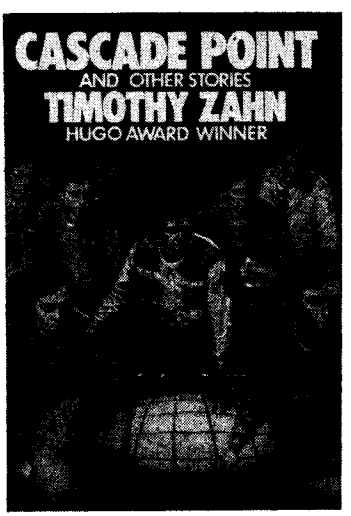

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water: The dust was settling out. When it came down dry, it was like gray-brown snow, piling obscene drifts on houses and trees and the bodies of small animals; the New Mexicans ruined the last of their jetcopters learning what rock dust does to turbines. Things were even worse when it came down wet, a black fluid that changed the drifts to mud. It was small consolation that the bombs were clean, and the dust a "natural product."

Korolev robots quickly rebuilt the monorails. Wil and the Dasgupta brothers took a trip down to the sea:

The dunes were gone, blasted inland by the rescue-day tsunamis. The trees south of the dunes were laid out flat, all pointing away from the sea. There was no green; all was covered with ash. Even the sea had a layer of scum on it. Miraculously, some fishermonkeys lived. Wil saw small groups on the beach, grooming the ash from each other's pelts. They spent most of their time in the water, which was still warm.

The rescue itself was an undoubted success. The Peacer bobble now sat on the surface. The third day after the detonation, a Korolev flier made it to the blast site. The pictures it sent back were striking. Gale force winds, still laden with ash, drove across gray scabland. Glowing orange-red peeked through netted cracks in the scab. At the center of this slowly freezing lake of rock sat a perfect sphere, the bobble. It floated two-thirds out of the rock. Of course, no nicks or scour marred its surface. No trace of ash or rock adhered. In fact, it was all but invisible: its mirror surface reflected the scene around it, showing the net of glowing cracks stretching back into the haze.

A typical bobble, in an untypical place.

"All things shall pass." That was Rohan Dasgupta's favorite misquote. In a few months, the molten lake would freeze over, and an unprotected man could walk right to the side of the Peacer bobble. About the same time, the blackout and the mud rains would end. For a few years there would be brilliant sunsets and unusually cool weather. Wounded trees would recover, seedlings would replace those that had died. In a century or two, nature would have forgotten this affront, and the Peacer bobble would reflect forest green.

Yet it would be unknown thousands of years before the bobble burst, and the men and women within could join the colony.

As usual, the Korolevs had a plan. As usual, the low-techs had little choice but to tag along.

"Hey, we're having a party tonight. Want to come?"

Wil and the others looked up from their shoveling. After three hours mucking around in the ash, they all looked pretty much the same. Black, white, Chinese, Indian, Aztlán—all were covered with gray ash.

The vision that confronted them was dressed in sparkling white. Her flying platform hovered just above the long pile of ash that the low-techs had pushed into the street. She was one of the Robinson daughters. Tammy? In any case, she looked like some twentieth century fashion plate: blond, tan, seventeen, friendly.

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Dilip Dasgupta grinned back at her. "We'd sure like to. But tonight? If we don't get this ash away from the houses before the Korolevs bobble up, we'll be stuck with it forever." Wil's back and arms were one big ache, but he had to agree. They had been doing this for two days, ever since the Korolevs announced tonight's departure. If they could get all the gray stuff pushed back from the houses before they bobbled up, it would be sluiced away by a thousand years of weather when they came back. Everyone on the street had pitched in, though with lots of grumbling—directed mostly at the Korolevs. The New Mexicans had even sent over some enlisted men with wheel barrows and shovels. Wil wondered about that: He couldn't believe that someone like Fraley was really overcome by a spirit of cooperation. This was either honest helpfulness on the part of lower officers, or else a subtle effort to bring the other low-techs into the NM camp, future allies against the Korolevs and the Peacers.

The Robinson girl leaned on her platform, and it driftred closer to Dasgupta. She looked up and down the street, then spoke with an air of confidentiality. "My folks like Yelén and Marta a lot—*really*. But Daddy thinks they carry some things too far. You Early Birds are going to be at our level of tech in a few decades anyway. Why should you have to slave like this?"

She bit at a fingernail. "I really wish you could come to our party . . . Hey! Why don't we do this: You keep working, say till about six. Maybe you can get it all cleaned by then, anyway. But if you can't, don't worry. My folks' robots can take care of what's left while you go get ready for the party." She smiled, then continued almost shyly. "Do you think that would be okay? Could you come then?"

Dilip looked at his brother Rohan, then replied, dead pan, "Why, uh, yes. With that backup, I think we could make it."

"Great! Now look. It's at our house starting around eight. So don't work past six, okay? And don't bother eating, either. We've got lots of food. The party'll go till the Witching Hour. That will leave you plenty of time to get home before the Korolevs bobble up."

Her flier drifted sideways, and climbed beyond the trees that encircled the houses. "See you!" Twelve sweaty shovel pushers watched her departure in numbed silence.

A smile spread slowly across Dilip's wide face. He looked at his shovel, and rolled his eyes at the others. Finally he shouted, "Screw it!", threw the shovel to the ground, and jumped up and down on it.

This provoked a heart-felt cheer from the others, the NM corporals included. In moments, the newly liberated workers had departed for their homes.

Only Brierson remained on the street, still looking in the direction taken by Robinson girl. He felt as much curiosity as gratitude. Will had done his best to know the high-techs: for all their idiosyncrasies, they'd seemed united behind the Korolevs. But no matter how friendly the disagreement, he saw now that they had factions, too. *I wonder what the Robinsons are selling.*

The public area of the Robinsons'

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place was friendlier than the Korolevs'. Incandescent lamps hung from oaken beams. The teak dance floor opened onto a buffet room, an outdoor terrace, and a darkened theater where the hosts promised some extraordinary home movies later.

While guests were still arriving, the younger Robinson children ran noisily about the dance floor, dodging among the guests in a wild game of tag. They were tolerated, more than tolerated. They were the only children in the world.

In some sense, almost everyone present was an exile. Some had been shanghaied, some had jumped to escape punishment (deserved and otherwise), some (like the Dasguptas) thought that stepping out of time for a couple centuries while their investments multiplied would make them rich. On the whole, their initial jumps had been short—into the twenty-fourth, twenty-fifth, twenty-sixth centuries.

But somewhere in the twenty-third, the rest of humanity disappeared. The travelers coming out just after the Extinction found ruins. Some—the most frivolous, and the most hurried of the criminals—had brought nothing with them. These starved, or lived a few pitiful years in the decaying mausoleum that was Earth. The better-equipped ones—the New Mexicans, for example—had the means to return to stasis. They bobbled forward through the third millennium, praying to find civilization revived. All they found was a world sinking back to nature, Man's works vanishing beneath jungle and forest and sea.

Even these travelers could survive only a few years in real time. They had no medical support, no way to maintain their machines or produce food. Their equipment would soon fail, leaving them stranded in the wilderness.

But a few, a very few, had left at the close of the twenty-second century—when technology gave individuals greater wealth than whole twentieth century nations. These few could maintain and reproduce all but the most advanced of their tools. Most departed civilization with a deliberate spirit of adventure. They had the resources to save the less fortunate scattered through the centuries, the millennia, and finally the megayears that passed.

Except for the Robinsons, no one had children. That was something reserved for the future, when humankind's ghosts made one last try at reclaiming the race's existence. So the kids who played raucous tag across the dance floor were a greater wonder than any high-tech magic. When the Robinson daughters gathered up their younger siblings for bed, there was a moment of strange, sad silence.

Wil drifted through the buffet room, stopping here and there to talk with his new acquaintances. He was determined to know everyone eventually. Quite a goal: If successful, he would know every living member of the human race. The largest group—and for Wil the most difficult to know—were the New Mexicans. Fraley himself was nowhere in sight, but most of his people were here. He spotted the corporals who had helped with the shoveling, and they introduced him to some others. Things were friendly till an NM officer joined the group.

Wil excused himself and moved slowly

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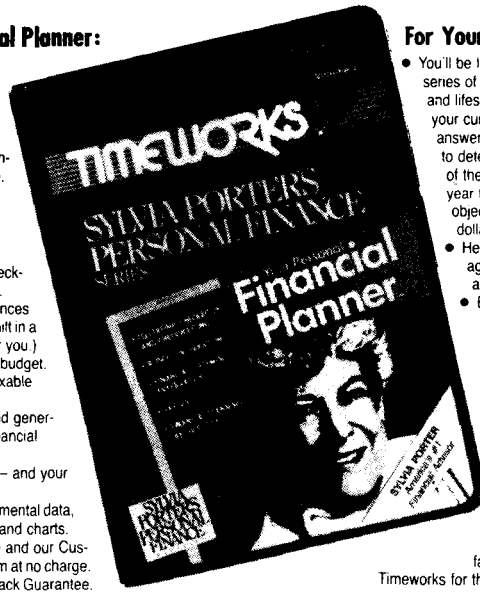

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toward the dance floor. Most of the advanced travelers were at the party, and they were mingling. A crowd surrounded Juan Chanson. The archeologist was arguing his theory of the Extinction. "Invasion. Extermination. That's the beginning and the end of it." He spoke a clipped, rattling dialect of English that made his opinions seem even more impressive.

"But, Professor," someone—Rohan Dasgupta—objected, "my brother and I came out of stasis in 2465. That couldn't have been more than a century after the Extinction. Newer Delhi was in ruins. Many of the buildings had completely fallen in. But we saw no evidence of nuking or lasing."

"Sure. I agree. Not around Delhi. But you must realize, my boy, you saw a very small part of the picture, indeed. It's a great misfortune that most of those who returned right after the Extinction didn't have the means to study what they saw. I can show you pictures . . . LA a fifty kilometer crater, Beijing a large lake. Even now, with the right equipment, you can find evidence of those blasts.

"I've spent centuries tracking down and interviewing the travelers who were alive in the late third millennium. Why, I even interviewed you." Chanson's eyes unfocused for a fraction of a second. Like most of the high-techs, he wore an interface band around his temples. A moment's thought could bring a flood of memory. "You and your brother. That was around 10,000 A.D., after the Korolev's rescued you—"

Dasgupta nodded eagerly. For him, it had been just weeks before. "Yes, they had moved us to Canada. I still don't know why—"

"Safety, my boy, safety. The Laurentian Shield is a stable place for long-term storage, almost as good as a cometary orbit." He waved his hand dismissingly. "The point is, *I* and a few other investigators have pieced together these separate bits of evidence. It is tricky; twenty-third century civilization maintained vast databases, but the media had decayed to uselessness within a few decades of the Extinction. We have fewer contemporary records from that era than we do from the Mayans'. But there is enough . . . I can show you: My reconstruction of the Norcross invasion graffiti, the punched vanadium tape that W.W. Sánchez found on Charon. These are the death screams of the human race.

"Looking at the evidence, any reasonable person must agree the Extinction was the result of wholesale violence directed against populations that were somehow defenseless.

"Now there are *some* who claim the human race simply killed itself, that we finally had the world-ending war that people worried about in the twentieth century—" He glanced at Monica Raines. The pinch-faced artist smiled back sourly, but didn't rise to the bait. Monica belonged to the "People Are No Damned Good" school of natural philosophy. The Extinction held no mysteries for her. After a moment, Chanson continued, "But if you really *study* the evidence, you'll see the traces of outside interference, you'll see that our race was murdered by something . . . from outside."

The woman next to Rohan gave a lit-

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tle gasp. "But these . . . these aliens. What became of them? Why, if they return—we're sitting ducks here!"

Wil stepped back from the fringes of the group and continued toward the dance floor. Behind him, he heard Juan Chanson's triumphant, "Exactly! That is the practical point of my investigations. We must mount guard on the solar frontiers—" his words were lost in the background chatter. Will shrugged to himself. Juan was one of the most approachable of the high-techs, and Wil had heard his spiel before. There was no question: the Extinction was the central mystery of their lives. Its explanation could be the key to survival. But rehashing the issues in casual conversation was like arguing theology—and it was depressing, to boot.

A dozen couples danced. On the stage, Alice Robinson and daughter Amy were running the music. Amy played something that looked like a guitar. Alice's instrument was a more conventional console. They improvised on a base of automatic music generators. Having two real humans out front, whose voices and hands were making part of the music, made the band exciting and real.

They played everything from Strauss waltzes, to the Beatles, to W.W. Arai. A couple of the Arai pieces Wil had never heard: they must have been written after his . . . departure. Partners changed from dance to dance. The Arai tunes brought more than thirty people onto the floor. Wil stayed at the edge of the floor, for the moment content to observe. On the other side, he saw Marta Korolev; her partner was not in evidence.

Marta stood swaying, snapping her fingers to the music, a faint smile on her face. She looked a little like Virginia: her chocolate skin was almost the shade Wil remembered. No doubt Marta's father or mother came from America. But the other side of her family was clearly Chinese.

Appearance aside, there were other similarities. Marta had Virginia's outgoing good humor. She combined common sense with uncommon sympathy. Wil watched her for many minutes, trying not to seem to watch. Several of the bolder partiers—Dilip was first—asked her to dance. She accepted enthusiastically, and soon was on the floor for almost every tune. She was very good to watch. If only—

A hand touched his shoulder and a feminine voice sounded in his ear, "Hey, Mr. Brierson, is it true you're a policeman?"

Wil looked into blue eyes just centimeters from his. Tammy Robinson stood on tiptoe to shout into his ear. Now that she had his attention, she stood down, which still left her a respectable 180 centimeters tall. She was dressed in the same spotless white as before. Her interface band looked like a bit of jewelry, holding back her long, blond hair. Her grin was bounded by dimples; even her eyes seemed to be smiling.

Brierson grinned back. "Yes. At least, I used to be a cop."

"Oh, wow." She took his arm in hers and edged them away from the loudness. "I never met a policeman before. But I guess that's not saying a lot."

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"Oh?"

"Yeah. I was born about ten mega-years after the Singularity—the Extinction, Juan calls it. I've read and watched all about cops and criminals and soldiers, but till now I've never actually met any."

Wil laughed. "Well, now you can meet all three."

Tammy was abashed. "I'm sorry. I'm really not that ignorant. I know that police are different from criminals and soldiers. But it's so strange: they're all careers that can't even exist unless lots of people decide to live together."

Lots of people. Like more than a single family. Brierson glimpsed the abyss that separated them.

"I think you'll like having other people around, Tammy."

She smiled, and squeezed his arm. "Daddy always says that. Now I'm beginning to understand."

"Just think. Before you're a hundred, Korolev Town will be almost like a city. There could be a couple of thousand people for you to know, people more interesting and worthwhile than criminals."

"Ugh. We're not going to stay for that. I want to be with lots of people —hundreds at least. But how could you stand to be locked in one little corner of time?" She looked at him, seemed suddenly to realize that Brierson's whole life had been stuck in a single century. "Gee. How can I explain it? Look—When you come from, there was air and space travel, right?" Brierson nodded. "You could go anywhere you wanted. Now suppose instead you had to spend your life in a house in a deep valley. Sometimes you hear stories about other places, but you can never climb out of the valley. Wouldn't that drive you crazy?

"That's how I'd feel about making a permanent stop at Korolev. We've been stopped for six weeks now. That's not long compared to some of our stops, but it's long enough for me to get the feeling: The animals aren't changing. I look out and the mountains just *sit* there." She made a little sound of frustration. "Oh, I can't explain it. But you'll see some of what I mean tonight. Daddy's going to show the video we made of Australia running into Asia. It's beautiful!"

Wil smiled. Bobbles didn't change the fact that time was a one-way trip.

She saw the denial in his eyes. "You must feel like I do. Just a little? I mean, why did you go into stasis in the first place?"

He shook his head. "Tammy, there are lots of people here who never asked to be bobbled . . . I was shanghaied." A crummy embezzlement case it had been. When he thought back, it was so fresh in his mind, in many ways more real than the world of the last few weeks. The assignment had seemed as safe as houses. The need for an armed investigator had been a formality, required by his company's archaic regs: the amount stolen was just over the 10,000 gAu. But someone had been desparate or careless . . . or just plain vicious. Most jurisdictions of Wil's era counted offensive bobbling of more than a century as manslaughter: Wil's stasis had lasted one thousand centuries. Of course, Wil did not consider the crime to be the murder of one W.W. Brierson. The crime was much more terrible than

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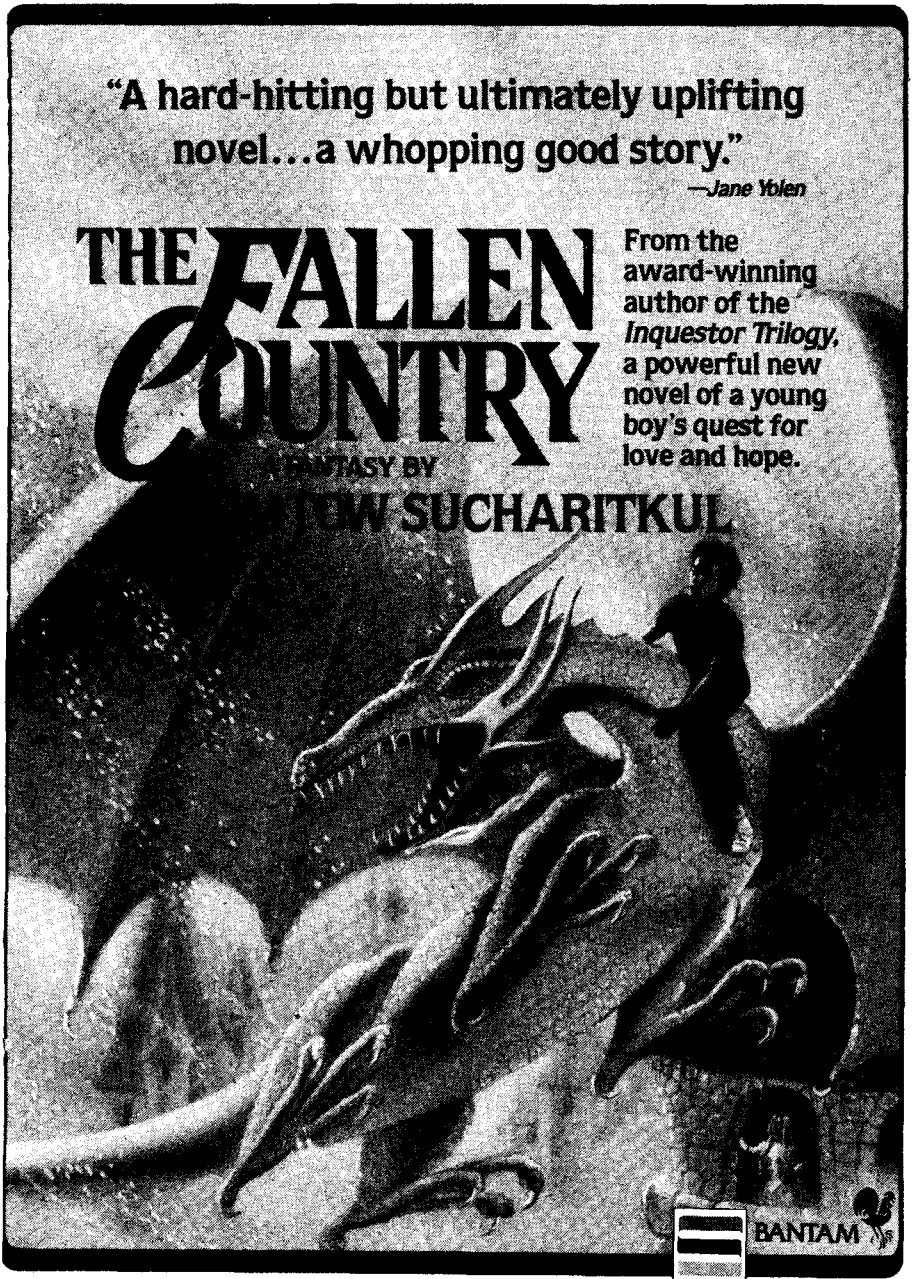
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that. The crime was the destruction of the world he had known, the family he loved.

Tammy's eyes grew wide as he told his story. She tried to understand, but Wil thought there was more wonder than sympathy in her look. He stopped short, embarrassed.

He was trying to think of a suitable change of subject when he noticed the pale figure on the far side of the dance floor. It was the person he'd seen at the beach. "Tammy, who's that?" He nodded in the direction of the stranger.

Tammy pulled her gaze away from his face and looked across the room. "Oh! She's weird, isn't she? She's a spacer. Can you imagine? In fifty million years, she could travel all over the galaxy. We think she's more than nine thousand years old. And all that time alone." Tammy shivered.

Nine thousand years. That would make her the oldest human Wil had ever seen. She certainly looked more human tonight than on the beach. For one thing, she wore more clothes: A blouse and skirt that were definitely feminine. Now her skull was covered with short black stubble. Her face was smooth and pale. Wil guessed that when her hair grew out, she might look like a normal young woman—Chinese, probably.

A half-meter of emptiness surrounded the spacer; elsewhere the crowd was packed close. Many clapped and sang; there was scarcely a person who could resist tapping a foot or nodding in time to the music. But the spacer stood quietly, almost motionless, her dark eyes staring impassively into the dancers. Occasionally her arm or leg would twitch, as if in some broken resonance with the tunes.

She seemed to sense Wil's gaze. She looked back at him, her eyes expressionless, analytical. This woman had seen more than the Robinsons, the Korolevs—more than all the high-techs put together. Was it his imagination that he suddenly felt like a bug on a slide? The woman's lips moved, the twitching motion he remembered from the beach. Then it had seemed a coldly alien, almost insectile gesture. Now Wil had a flash of insight: After nine thousand years alone, nine thousand years on God knows how many worlds, would a person still remember the simple things —like how to smile?

"C'mon, Mr. Brierson, let's dance." Tammy Robinson's hand was insistent on his elbow.

Wil danced more that night than since he'd been dating Virginia. The Robinson kid just wouldn't quit. She didn't really have more stamina than Brierson. He kept in condition and kept his bio-age around twenty; with his large frame and tendency to overweight he couldn't afford to be fashionably middle-aged. But Tammy had the *enthusiasm* of a seventeen-year-old. Paint her a different color and she reminded him of his daughter Anne: cuddly, bright, and just a bit predatory when it came to the males she wanted.

The music swept them round and round, taking Marta Korolev in and out of his view. Marta danced only a couple times with any one partner and spent considerable time off the floor, talking. This evening would leave the Korolev reputation substantially mellowed. Later,

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when he saw her depart for the theater, he suppressed a sigh of relief. It had been a depressing little game, watching her and watching her, and all the time pretending not to.

The lights brightened and the music faded. "It's about an hour to midnight, folks," came Don Robinson's voice. "You're welcome to dance till the Witching Hour, but I've got some pictures and ideas I'd like to share with you. If you're interested, please step down the hall."

"That's the video I was telling you about. You've got to hear what Daddy has to say." Tammy led him off the floor, even though another song was starting. The music had lost some of its vibrancy. Amy and Alice Robinson had left the bandstand. The rest of the evening would be uninterpreted recordings.

Behind them, the crowd around the dance floor was breaking up. There had been hints through the evening that this last entertainment would be the most spectacular. Almost everyone would be in the Robinson's theater.

As they walked down the hall, the lights above them went dim. The theater itself was awash with blue light. A four-meter globe of Earth hung above the seats. It was an effect Wil had seen before, though never on this scale. Given several satellite views it was possible to construct a hologram of the entire planet and hang its blue-green perfection before the viewer. From the entrance to the theater, the world was in quarter phase, morning just touching the Himalayas. Moonlight glinted faintly off the Indian Ocean. The continental outlines were the familiar ones from the Age of Man.

Yet there was something strange about the image. It took Wil a second to realize just what: There were no clouds.

He was about to walk around the globe to the seating when he noticed two shadows beyond the dark side. It looked like Don Robinson and Marta Korolev. Wil paused, resisting Tammy's urging that they hurry to get the best seats. The room was rapidly filling with party goers, but Wil guessed he was the only one who had noticed Robinson and Korolev. There was something strange here: Korolev's bearing was tense. Every few seconds she chopped at the air between them. The shadow that was Don Robinson stood motionless, even as Korolev became more excited. Wil had the impression of short, unsatisfactory replies being given to impassioned demands. Wil couldn't hear the words; either they were behind a sound screen, or they weren't talking out loud. Finally Robinson turned and walked out of sight behind the globe. Marta followed, still gesturing.

Even Tammy hadn't noticed. She led Brierson to the edge of the audience area and they sat. A minute passed. Wil saw Marta emerge from beyond the sunlit hemisphere and walk behind the audience to sit near the door.

Then there was music, just loud enough to still the audience. Tammy touched Wil's hand. "Oh. Here comes Daddy."

Don Robinson suddenly appeared by the sunside hemisphere. He cast no shadow on the globe, though both shone in the synthetic sunlight. "Good evening, everyone. I thought to end our party with this little light show—and a

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few ideas I'm hoping you'll think about." He held up his hand, and grinned disarmingly. "I promise, mostly pictures!"

His image turned to pat the surface of the globe familiarly. "All but a lucky few of us began our journey downtime unprepared. That first bobbling was an accident or was intended as a single jump to what we guessed would be a friendlier future civilization. Unfortunately—as we all discovered—there is no such civilization, and many of us were stranded." Robinson's voice was friendly, smooth, the tone traditionally associated with the selling of breakfast food or religion. It irritated Wil that Robinson said "we" and "us" even when he was speaking specifically of the low-tech travelers.

"Now there were a few who were well-equipped. Some of these have worked to rescue the stranded, to bring us all together where we can freely decide humanity's new course. My family, Juan Chanson, and others did what we could—but it was the Korolevs who had the resources to bring this off. Marta Korolev is here tonight." He waved generously in her direction. "I think Marta and Yelén deserve a big hand." There was polite applause.

He patted the globe again. "Don't worry. I'm getting to our friend here. . . . One problem with all this rescuing is that most of us have spent the last fifty million years in long-term stasis, waiting for all the 'principals' to be gathered for this final debate. Fifty million years is a long time to be gone; a lot has happened.

"That's what I want to share with you tonight. Alice and the kids and I were among the fortunate. We have advanced bobblers and plenty of autonomous devices. We've been out of stasis hundreds of times. We've been able to live and grow along with the Earth. The pictures I'm going to show you tonight are the 'home movies,' if you will, of our trip to the present.

"I'm going to start with the big picture—the Earth from space. The image you see here is really a composite—I've averaged out the cloud cover. It was recorded early in the Fourth Millennium, just after the Age of Man. This is our starting point.

"Let's begin the journey." Robinson vanished and they had an unobstructed view of the globe. Now Wil noticed a gray haze that seemed to waver around the polar ice cap. "We're moving forward about half a megayear per minute. The camera satellites were programmed to take pictures at the same local time every year. At this rate, even climate cycles are visible only as a softening of picture definition." The gray haze—it must be the edge of the Antarctic ice pack! Wil looked more carefully at Asia. There was a blurring, a fantastically rapid mottling of greens and tans. Droughts and wetness. Forest and jungle battling savannah and desert. In the north, white flickered like lightning. Suddenly the glaring whiteness flashed southward. It surged and retreated, again, again. In less than a quarter of a minute it was gone back to the northern horizon. Except for shimmering whiteness in the Himalayas, the greens and tans lived once more across Asia. "We had a pretty good ice-age there," Robinson explained. "It lasted more than one hundred thousand years. . . .

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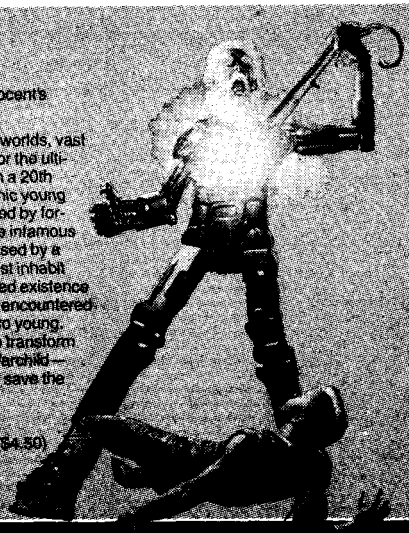

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We're beyond the immediate neighborhood of Man now. I'm going to speed us up . . . to five megayears per minute."

Wil glanced at Marta Korolev: she was watching the show, but her face held an uncharacteristic look of displeasure. Her hands were clenched into fists.

Tammy Robinson leaned from her seat to whisper, "This is where it really gets good, Mr. Brierson!"

Wil turned back to the display, but his attention was split between the view and the mystery of Marta's anger.

Five million years every minute. Glacier and desert and forest and jungle blended. One color or another might fleetingly dominate the pastel haze, but the overall impression was stable and soothing. Only now . . . only now, the continents themselves were moving! A murmur passed around the room as the audience realized what they were seeing. Australia had moved north, sliding into the eastern islands of the Indonesian archipelago. Mountains puckered along the collision. This part of the world was near the sunrise line. Low sunlight cast the new mountains in relief.

There was sound, too: From the surface of the globe, Wil heard something that reminded him of wood surfaces squeaking wetly across each other. A sound like crumpling paper accompanied the birth of the Indonesian Alps. "Those noises are real, friends," said Don Robinson. "We kept a system of seismophones on the surface. What you're hearing are long-term averages of seismic action. It took thousands of major earthquakes to make every second of those sounds."

As he spoke, Australia and Indonesia merged, the combination continuing its slide northward, turning slightly as it came. Already the form of the Inland Sea could be discerned. "No one predicted what happened next," continued Robinson's travelogue. "There! Notice the rift spreading through Kampuchea, breaking the Asian plate." A string of narrow lakes appeared across Southeast Asia. "In a moment, we'll see the new platelet reverse direction and ram *back* into China—to build the Kampuchean Alps."

From the corner of his eye, Brierson saw Marta heading for the door. *What is going on here?* He started to get up, found that Tammy's arm was still around his.

"Wait. Why are you going, Mr. Brierson?" she whispered, starting to get up.

"I've got to check on something, Tammy."

"But—" She seemed to realize that extended discussion would detract from her father's show. She sat down, looking puzzled and a little hurt.

"Sorry, Tam," Wil whispered. He headed for the door. Behind him, continents crashed.

The Witching Hour. The time between midnight and the start of the next day. It was more like seventy-five minutes than an hour. Since the Age of Man, the Earth's rotation had slowed. Now, at fifty megayears, the day was a little over twenty-five hours long. Rather than change the definition of the second or the hour, the Korolevs had decreed (just another of their decrees) that the standard day should consist of

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twenty-four hours plus whatever time it took to complete one rotation. Yelén called the extra time the Fudge Factor. Everyone else called it the Witching Hour.

Wil walked through the Witching Hour, looking for some sign of Marta Korolev. He was still on the Robinson estate, that was obvious: As advanced travelers, the Robinsons had plenty of robots. Rescue day ash had been meticulously cleaned from the stone seats, the fountains, the trees, even the ground. The scent of almost-jacarandas floated in the cool night breeze.

Even without the tiny lights that floated along the paths, Wil could have found his way without difficulty. For the first time since the blow-off, the night was clear—well, not really *clear*, but he could see the Moon. Its wan light was only faintly reddened by stratospheric ash. The old girl looked pretty much as she had in Wil's time, though the stains of industrial pollution were gone. Rohan Dasgupta claimed the Moon was a little farther out now, that there would never again be a total eclipse of the sun. The difference was not enough for Wil to see.

The reddish-silver light fell bright across the Robinson's gardens, but Marta was nowhere in sight. Wil stopped, let his breath out, and listened. There were footsteps. He jogged in their direction, and caught up with Korolev still inside the estate.

"Marta, wait." She had already stopped and turned to face him. Something dark and massive floated a few meters above her. Wil glanced at it, and slowed to a walk. These autonomous devices still made him uneasy. They hadn't existed in his time, and no matter how often he was told they were safe, it was still unnerving to think of the firepower they controlled—independent of the direct commands of their masters. With her protector floating nearby, Marta was almost as safe as back in castle Korolev.

Now that he'd caught up with her, he didn't know quite what to say. "What's the matter, Marta? I mean, is anything wrong?"

At first, he thought she would not answer. She stood with balled fists. The moonlight showed tear streaks on her face. She slumped and brought her hands up to her temples. "That b-bastard Robinson. That slimy bastard!" The words were choked.

Wil stepped closer. The protection device move forward, keeping him in clear view. "What happened?"

"You want to know? I'll tell you . . . but let's sit down. I-I don't think I can stand much longer. I'm s-so *mad.*" She walked to a nearby bench and sat. Wil lowered his bulk beside her, then started. To the hand, the bench felt like stone, but it yielded to main body weight like a cushion.

Marta put a hand on his arm, and for an instant he thought she might touch her head to his shoulder. The world was a very empty place now, and Marta reminded him so much of things lost. . . . But coming between the Korolevs was probably the single most boorish, the single most dangerous, thing he could do. Wil said abruptly, "This may not be the best place to talk." He waved at the fountain and the carefully tended trees. "I'll bet the Robinsons monitor the whole estate."

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"Hah! We're screened." Marta moved her hand from his arm. "Besides, Don knows what I think of him.

"All these years, they've pretended to support our Plan. We helped them, gave them factory designs that didn't exist when they left civilization. All the time, they were just waiting—taking their pretty pictures—while we did all the work, bringing what was left of the human race to one place and time.

"And now that we have everyone together, now that we need everyone's cooperation, *now* they start sweet-talking people away from us. Well, I'll tell you, Wil. Our settlement is humankind's last chance. I'll do anything, *anything*, to protect it." Marta had always seemed so cheerful, optimistic. That made her fury even more striking. But the one did not make hypocrisy of the other. Marta was like a mother cat, suddenly ferocious and deadly in protecting her kittens.

"So the Robinsons want to break up the town? Do they want their own colony?"

Marta nodded. "But not like you think. Those lunatics want to continue down time, sightseeing their way into eternity. Robinson figures if he can persuade most of us to come along, he'll have a stable system. He calls it a 'time-like urbanization.' For the next few billion years, his colony would spend about a month per megayear outside of stasis. As the sun goes off main sequence, they'll move into space and bobble through longer and longer jumps. He literally wants to follow the evolution of the whole goddamned universe!"

Brierson remembered Tammy Robinson's impatience with living at the same rate as the universe. She'd been campaigning for the scheme her father must now be selling to the audience back in the theater.

Wil shook his head, and chuckled. "Sorry. I'm not laughing at you, Marta. It's just that compared to the things you should be worried about, this is ludicrous.

"Look. Most of the low-techs are like me. It's been only weeks of objective time since I left civilization. Even the New Mexicans spent only a few years in real time before you rescued them. We haven't lived centuries 'on the road' like you advanced types. We're still hurting. More than anything, we want to stop and rebuild."

"But Robinson is so slick."

"He's so slick you can scrape the grease off. You've been away from that kind for a long, long time. Back in civilization, we were exposed to sales pressure almost every day. . . . There's only one lever he has, and that's something you should be worrying about in any case."

Marta smiled wanly. "Yelén and I worry about so many things, Wil. You have something new for us?"

"Maybe." Wil was silent for a moment. The fountain across from their bench burbled loud. There were soft hooting sounds in trees. He hadn't expected this opportunity. Until now the Korolevs had been approachable enough, but they didn't seem to listen. "We're all grateful to you and Yelén. You saved us from death—or at least from life alone in an empty world. We have a chance to start the human race again. . . . But at the same time, a lot of low-techs

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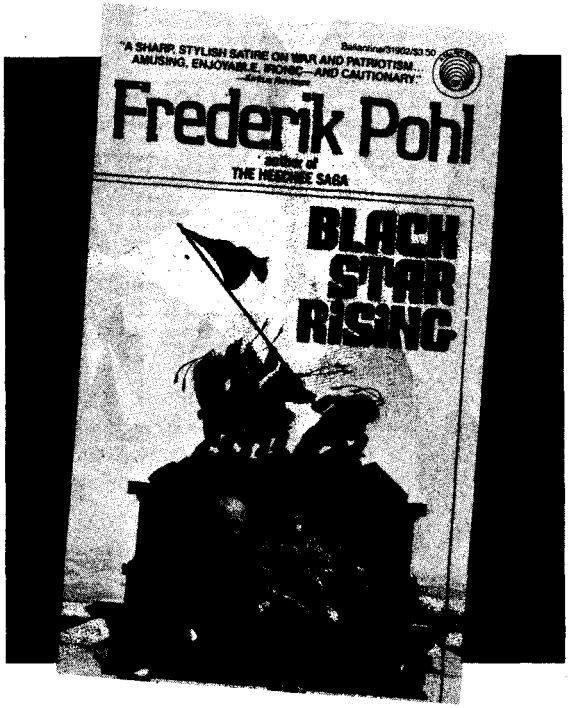
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resent you advanced travelers in your castles above town. They resent the fact that you make all the decisions, that you decide what you will share and what we will work at."

"I know. We haven't explained things very well. We seem omnipotent. But don't you see, Wil? We high-techs are a few people from around 2200 who brought our era's version of good quality camping and survival gear. Sure, we can make most any consumer product of your time. But we *can't* reproduce the most advanced of our own devices. When those finally break, we'll be as helpless as you."

"I thought your autons were good for hundreds of years?"

"Sure, if we use them for ourselves alone. Supporting an army of low-techs cuts us down to less than a century. We *need* each other, Wil. Apart, both groups face dead ends. Together we have a chance. We can supply you with databases, equipment, and a good approximation to a twenty-first century standard of living—for a few decades. As our support decays, you provide the human hands and minds and ingenuity to fill the gaps. If we can get a high birth rate, and build a twenty-first century infrastructure, we may pull this out."

"Willing hands? Like the ash shoveling we had to do this afternoon?" He didn't mean the question to sound nasty, but it came out that way.

She touched his arm again. "No, Wil. That was dumb of us. Arrogant." She paused, her eyes searching his.

"Have you ever been ram-jetting, Wil?"

"Huh? Uh, no." In general, Wil didn't go *looking* for trouble.

"But it was a big sport in your time, wasn't it? Sort of like hang-gliding, but a lot more exciting—especially for the purists who didn't carry bobblers. Our situation reminds me of a typical ram-jet catastrophe: You're twenty thousand meters up, ramming along. All of a sudden your jet flames out. It's an interesting problem. Those little rigs didn't mass more than a few hundred kilos; they didn't carry turbines. So all you can do is dive hell down. If you can get your airspeed above mach one, you can usually relight the ram; if not, you make a nice crater.

"Well, we're sitting pretty right now. But the underlying civilization has flamed out. We have a *long* way to fall. Counting the Peacers, there will be almost three hundred low-techs. With your help we ought to be able to relight at some decent level of technology—say twentieth or twenty-first century. If we can, we'll quickly climb back. If we can't, if we fall to a pre-machine age when our autons fail . . . we'll be just too primitive and too few to survive. So. The ash shoveling was unnecessary. But I can't disguise the fact that there will be hard times, terribly hard work."

She looked down. "I know you've heard most of this before, Wil. It's a hard package to sell, isn't it? But I thought I would have more time. I thought I could convince most of you of our good will. . . I never counted on Don Robinson and his slick promises and good fellowship."

Marta looked so forlorn. He reached out to pat her shoulder. No doubt Robinson had plans similar to the Korolevs', plans that would remain secret until the low-techs were safely suckered

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into his family's journey. "I think that most of us low-techs will see through Robinson. If you make it clear where his promises must be lies. If you can come down from the castle. Concentrate on Fraley; if Robinson convinces him, you might lose the New Mexicans. Fraley isn't dumb, but he is rigid and he lets his anger run away with him. He really does hate the Peacers." *Almost as much as he hates me.*

Half a minute passed. Marta gave a short, bitter laugh. "So many enemies. The Korolevs hate the Robinsons, the NMs hate the Peacers, almost everybody hates the Korolevs."

"And Monica Raines hates all mankind."

This time her laugh was lighter. "Yes. Poor Monica." Marta leaned toward him, and this time really did rest her head against his shoulder. Wil's arm slipped automatically across her back. She sighed. "We're two hundred people, just about all that's left. And I swear we have more jealousy and scheming than twentieth century Asia."

They sat in silence, her head against him, his hand resting lightly against her back. He felt the tension slowly leave her body. For Wil it was different. *Oh Virginia, what to do?* Marta felt so good. It would be so easy to caress that back, to slide his hand down to her waist. Most likely there'd be a moment of embarrassed backing away. But if she responded. . . . If she responded, they'd be adding one more set of jealousies to the brew.

So Wil's hand did not move. In later times, he often wondered if things might have gone differently had he not chosen the path of sanity and caution.

He thought wildly for a moment, finally discovered a topic that was sure to break the mood: "You know I'm one of the shanghaied ones, Marta."

"Mmhmm."

"The crime is a strange one, bobbling someone into the far future. In may be murder, but the court can't know for sure. In my time, most jurisdictions had a special punishment for it."

Silence.

"They'd bobble survival equipment and the trial record next to the victim. Then they'd take the bastard who created the problem and bobble him too—so he'd come out of stasis just *after* the victim—"

The spell was broken. Marta pulled slowly back. She could tell what was coming. "Sometimes the courts couldn't know the duration."

Wil nodded. "In my case, I'll bet the duration was known. *And* I'll bet even more that there was a conviction. There were only three suspects; I was closing in on that damned embezzler. That's why he panicked."

He paused. "Did you rescue him, Marta? Did you rescue the . . . person . . . who did this to me?"

She shook her head. Her openness deserted her when she had to lie. "You've got to tell me, Marta. I don't need revenge—" perhaps a small lie there, "—but I do need to know."

She shook her head again, but this time replied. "We can't, Wil. We need everyone. Can't you see that all such crimes are meaningless now?"

"For my own protection—"

She got up, and after a second Wil did, too.

"No. We've given him a new face

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and a new name. He has no motive for harming you now, and we've warned him what we'll do if he tries."

Brierson shrugged. At least, he had more information.

"Hey, Wil, have I made myself another enemy?"

"N-no. I'm not giving up on this, Marta. But I could never be your enemy. And I want the settlement to succeed as much as you and Yelén."

"I know." She raised her hand in a half-wave. "G'night, Wil."

"Good night."

She walked into the darkness, her robot protector floating close above her shoulder.

3

Things had changed by "next" morning. At first, the changes were what Brierson had expected:

Gone was the drear ash and dirty sky. Dawn splashed sunlight across his bed; he could see a wedge of blue between green-leafed trees. Wil came slowly awake, something deep inside saying it was all a dream. He closed his eyes, opened them again, and stared into the brightness.

They did it. "By God, they really did it." He rolled out of bed, and pulled on some clothes. He shouldn't really be surprised. The Korolevs had announced their plan. Sometime in the morning hours, after the Robinson party was over and when their surveillance showed everyone safe at home, they had bobbled every building in the settlement. Through unknown centuries they bobbled forward, coming out of stasis for a few seconds every year, just long enough to check if the Peacer bobble had burst.

Wil rushed down the stairs, past the kitchen. Breakfast could be skipped. Just to see the green and the blue and the clean sunlight made him feel like a kid at Christmas. Then he was outside, standing in the sunlight. The street was nearly gone. Almost-jacarandas had sprouted through its surface. Their lowest flowers floated a meter above his head. Spider families scampered through the leaves. The huge pile of ash that he and the Dasguptas and the others had pushed into the middle of the street was gone, washed away by a hundred—a thousand?—rainy seasons. The only sign of that long ago pollution was around Wil's house. A circular arc marked where the stasis field had intersected the ground. Outside was green and growing; inside was covered with gray ash, the trees and plants dying.

As Wil wandered through the young forest that the street had become, the wrongness of the scene gradually percolated through: everything was alive, but there was not another human, not a single robot. Had everyone wakened earlier, say at the moment the bobbles burst?

He walked down to the Dasguptas' place. Half-hidden by the brush, he saw someone big and black heading his way—his own reflection. The Dasguptas were still in stasis. The trees grew right up to their bobble. Rainbow webs floated around it, but the surface was untouched. Neither vines nor spiders could find purchase on that mirrored smoothness.

Wil ran through the forest, panic rising in him. Now that he knew what to

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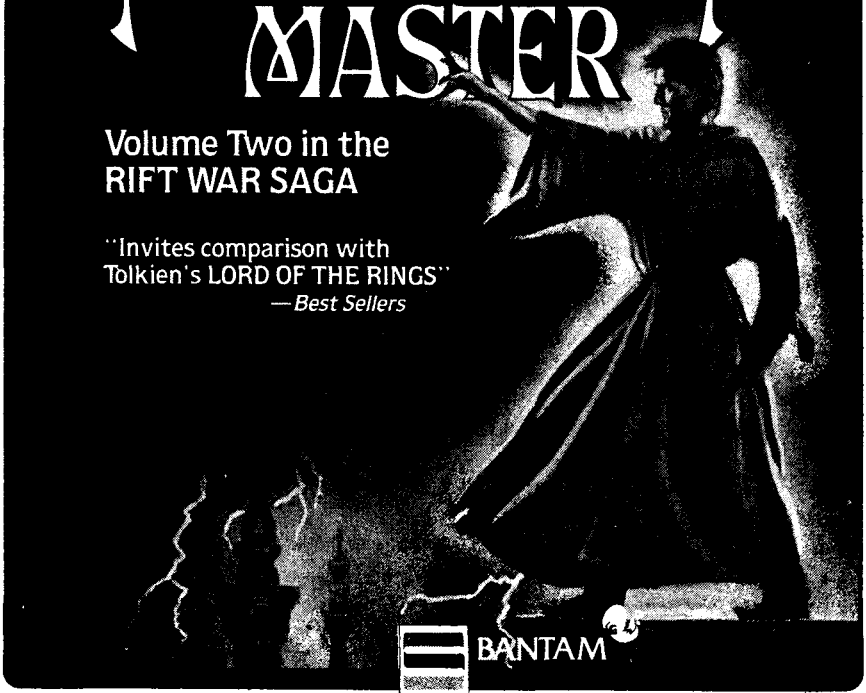

BANTAM

SPECTRA

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look for, they were easy to spot: The sun's image glinted off two, three, half a dozen bobbles. Only his had burst. He looked at the trees, the birds, and the spiders. The scene was scarcely pleasing now. How long could he live without civilization? The rest might come out of stasis in moments or a hundred years, or a thousand; he had no way of knowing. In the meantime Wil was alone, perhaps the only living man on Earth.

He left the street and scrambled up a rise, into older trees. From the top, he should be able to see some of the estates of the advanced travelers. The fear tightened at this throat. Sun and sky sat in the green of the hills: there were bobbles where the palaces of Juan Chanson and Phil Genet should be. He looked south, toward castle Korolev.

Spires, gold and green! No bobble there!

And in the air above the castle, he saw three close-set dots: fliers, moving fast and straight toward him, like some old-time fighters on a strafing run. The trio was over him in seconds. The middle flier descended and invited him into its passenger cabin.

The ground fell slantingly away. He had a moment's vision of the Inland Sea, blue through coastal haze. There were bobbles around the advanced estates, around the NM quarter of town. To the west were several large ones—around the autofactories? Everything was in stasis, except the Korolev estate. He was above the castle now, coming down fast. The gardens and towers looked as before, but an enormous circle circumscribed the estate—a subtle yet abrupt change in the tone of the forest's green. Like himself, the Korolevs had been in stasis up to the recent past. For some reason they were leaving the rest bobbled. For some reason they wanted private words with W.W. Brierson.

The Korolev library had no bookcases weighted down with data cartridges or paper-and-ink books. Data could be accessed anywhere; the library was a place to sit and think (with appropriate support devices) or to hold a small conference. The walls were lined with holo windows showing the surrounding countryside. Yelén Korolev sat at the middle of a long, marble table. She motioned Wil to sit across from her.

"Where's Marta?" Brierson asked automatically.

"Marta is . . . dead, Inspector Brierson." Yelén's voice was even flatter than usual. "Murdered."

Time seemed to stop. *Marta. Dead?* He had taken bullets with less physical sensation than those words brought. His mouth opened, but the questions wouldn't come. In any case, Yelén had questions of her own. "And I want to know what you had to do with it, Brierson."

Wil shook his head, in confusion more than denial.

She slapped the marble table top. "Wake up, Mister! I'm talking to you. You're the last person who saw her alive. She rejected your advances. Did that make it worth killing her, Brierson? *Did it?*"

The insanity of the accusation brought Wil back to his senses. He stared at Yelén, realizing that she was in a much worse state than he. Like her Marta, Yelén Korolev had been raised in late twenty-second century Hainan. But Yelén

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had no trace of Chinese blood. She was descended from the Russians who had filtered out of Central Asia after the 1997 debacle. Her fair slavic features were normally cool, occasionally showing ironic humor. Those features were as smooth as ever now, but the woman kept running her hand across her chin, her forefinger tracing again and again the edge of her lip. She was in a state of wall-eyed shock that Wil had seen only a couple of times before—and those times had been filled with sudden death. From the corner of his eyes, he saw one of her protection robots float around the far side of the table—keeping her widely separated from its target.

"Yelén," he finally said, trying to keep his voice calm and reasonable, "till this moment I didn't know about Marta. I liked . . . respected . . . her more than anyone in the settlement. I could never harm her."

Korolev stared at him a long moment, then let out a shaky breath. The feeling of deadly tension lessened. "I know what you tried to do that night, Brierson. I know how you thought to repay our charity. I'll always hate your guts because of it. . . . But you're telling the truth about one thing: There's no way you—or any low-tech—could have killed Marta."

She looked through him, remembering her lost partner, or perhaps communicating through her headband. When she spoke again her voice was softer, almost lost. "You were a policeman, in a century where murder was still common. You're even famous. When I was a kid, I read all about you. . . . I'll do anything to get Marta's killer, Inspector."

Wil leaned forward. "What happened, Yelén?" he said quietly.

"She, she was marooned—left outside all our bobbles."

For a moment, Wil didn't understand. Then he remembered walking the deserted street and wondering if he were all alone, wondering how many years would pass before the other bobbles burst. Before, he had thought that being shanghaied into the future was the most terrible bobble crime. Now he saw that being marooned in an empty present could be just as awful.

"How long was she alone, Yelén?"

"Forty years. *Just forty god-damned years*. But she had no health care. She had no robots. She had just the clothes on her back. I'm p-proud of her. She lasted forty years. She survived the wilderness, the loneliness, her own aging. For forty years. And she almost won through. Another ten years—" her voice broke and she covered her eyes. "Back up, Korolev," she said. "Just the facts."

"You know we have to move down time to when the Peacer bobble bursts. We planned to begin the move on the night of the party. After everyone was indoors, we'd bobble forward in three-month steps. Every three months, the bobbles would burst and our sensors would take a few microseconds to check the fast flicker autons, to see if the Peacers were still in stasis. If they were, we'd automatically bobble up for another three months. Even if we waited a hundred thousand years, all you'd have seen was a second or so of flickering and flashing.

"So. That was the plan. What happened was that the first jump was a century long—for everything in near-earth

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space. The other advanced travelers had agreed to follow our programming on this. They were in stasis, too. The difference between three months and a century was not enough to alarm their controller programs. Marta was alone. Once she figured out that the flicker interval was more than three months, she hiked around the Inland Sea to the Peace Authority bobble."

That was a 2500 kilometer hike.

Yelén noticed the wonder on his face. "We're survivors, Inspector. We didn't last this long by letting difficulties stop us.

"Anyway, the area around the Peace bobble is still a vitrified plain. It took her decades, but she built a sign there." The window behind Yelén suddenly became a view from space: At that distance, the bobble was just a glint of sunlight with a spiky shadow. A jagged black line extended northward from it. Apparently the picture was taken at local dawn, and the black strip was the shadow of Marta's monument. It must have been several meters high and dozens of kilometers long. The image lasted only seconds, the space of time Yelén imagined it.

"You may not know this, but we have lots of equipment at the Lagrange zones. Some of it is in kiloyear stasis. Some is flickering with a period of decades. None of it is carefully watching the ground . . . but that line structure was enough to trip even a high-threshold monitor. Eventually, the robots sent a lander to investigate. . . . They were just a few years too late."

Wil forced his mind past thinking on what the lander found. Thank God Yelén's imagination didn't flash that on the windows.

For now—method: "How could this be done? I thought an old-time army couldn't match the security of your household automation."

"That's true. No low-tech could break in. At first glance, even the advanced travelers couldn't manage this: it's possible to outfight a high-tech—but the battles are abrupt and obvious. What happened here was sabotage. And I think I have it figured out. Somebody used our external comm to talk to the scheduling programs. Those weren't as secure as they should be. Marta was cut out of the check roster, and a one century total blackout was substituted for the original flicker scheme. The murderer was lucky: if he had tried for anything longer, it would have tripped all sorts of alarms."

"Could it happen again?"

"No. Whoever did it is good, Brierson. But basically they took advantage of a bug. That bug no longer exists. And I'm being much more careful about how my machines accept outside comm now."

Wil nodded. This was a century beyond him, even if his specialty had been forensic computing. He'd just have to take her word that there was no further danger—of this sort of assassination. Wil's strength was in the human side. For instance:

"Motive. Who would want Marta dead?"

Yelén's laugh was bitter. "My suspects." The windows of the library became a mosaic of the settlement's population. Some had only small pictures—all the New Mexicans fitted on

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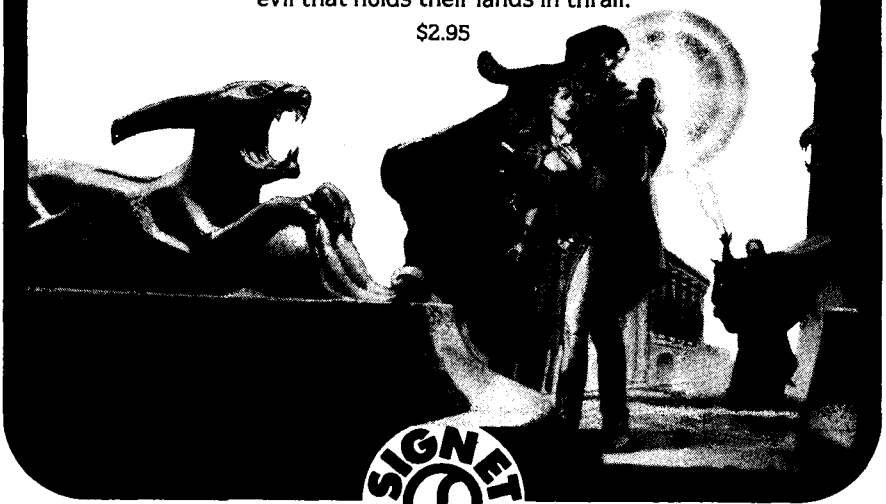

SIGNET FANTASY

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a single panel. Others—Brierson, for instance—rated more space. "Almost everybody conceives some grudge against us. But you twenty-first century types just don't have the background to pull this off. No matter how attractive the notion," she looked at Wil, "you're off the list." The pictures of the low-techs vanished from the windows.

The rest stood like posters against the landscape beyond. These were all the advanced travelers (Yelén excepted): The Robinsons, Juan Chanson, Monica Raines, Philippe Genet, Tunç Blumenthal, Jason Mudge—and the woman Tammy said was a spacer.

"The motive, Inspector Brierson? I can't afford to consider that it was anything less than the destruction of our settlement. One of these people wants humanity permanently extinct, or—more likely—wants to run his own show with the people we've rescued; it would probably come to the same thing."

"But why Marta? Killing her has tipped their hand without—"

"—without stopping the Korolev Plan? You don't understand, Brierson." She ran a hand through her blond hair, and stared down at the table. "I don't think any of you understand. You know I'm an engineer. You know I'm a hardheaded type who's made a lot of unpopular decisions. The Plan would never have gotten this far without me.

"What you don't know is that Marta was the brains behind it all. Back in civilization, Marta was a project manager. One of the best. she had this figured out even before we left civilization. She could see that technology and people were headed into some sort of singularity in the twenty-third century. She really wanted to help the people who were stranded downtime. . . . Now we have the settlement. To make it succeed is going to take the special genius she had. I know how to make the gadgets work, and I can outshoot most anyone in a clean fight. But it could all fall apart now, without Marta. We are so few here; there are so many internal jealousies.

"I think the killer knew this, too."

Wil nodded, a little surprised that Yelén realized her own failings so clearly.

"I'm going to have my hands full, Brierson. I intend to spend many decades of my life preparing for the time when the Peacers come out and I bring the settlement back. If Marta's dream is to succeed, I can't afford to use my own time hunting the killer. *But I want that killer, Brierson.* Sometimes . . . sometimes I feel a little crazy, I want him so bad. I'll give you any reasonable support in this. Will you take the case?"

Even at fifty megayears, there was still a job for Wil Brierson.

There was one obvious thing he should demand, something he would not hesitate to require if he were back in civilization. He glanced at Yelén's auton, still hovering at the end of the table. Here . . . it might be better to wait for witnesses. Powerful ones. Finally he said, "I'll need personal transportation. Physical protection. Some means of publicly communicating with the entire settlement—I'll want their cooperation on this problem."

"Done."

"I'll also need your databases, at least where they deal with people in the

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settlment. I want to know where and when everyone originated, and exactly how they got bobbled past the Extinction."

Korolev's eyes narrowed. "Is this for your personal vendetta, Brierson? The past is dead. I'll not have you stirring up trouble with people who were once your enemies. Besides, the low-techs aren't suspects; there's no need for you to be sniffing around them."

This was just like old times: the customers deciding what the professional should see. "You're a high-tech, Yelén. But you're using a low-tech person, namely me. What makes you think the enemy doesn't have *his* accomplices?" People like Steve Fraley were the puppets now. They yearned to be the puppeteers. Playing Korolev against her enemy was a game the New Mexican president would love.

"Mph. Okay. You'll get the databases—but with your shanghai case locked out."

"And I want the sort of high-speed interface you have."

"Do you know how to use it?" Her hand brushed absently at her headband.

"Uh, no."

"Then forget it. The modern versions are a lot easier to learn than the kind you had, but I grew up with one and I still can't properly visualize with it. If you don't start as a child, you may spend years and never get the hang of it."

"Look, Yelén. Time is the one thing we've got. It's God knows how many thousands of years till the Peacers come out and you restart the settlement. Even if it took me fifty years to learn, it wouldn't interfere."

"Time is something *you* don't have, Mister. If you spend a century tooling up for this job, you'll lose the viewpoint that's your value to me."

She had a point. He remembered how Marta had misunderstood the effect of Robinson's sales pitch.

"Sure," she continued, "there are high-tech angles to the murder. Maybe they're the most important angles. But I've already got expert help in that department."

"Oh? Someone you can trust among the high-techs?" He waved at the mug shots on the walls.

Korolev smiled thinly. "Someone I can *dis*trust less than the others. Never forget, Brierson, my devices will be watching all of you." She thought for a moment. "I was hoping she'd be back in time for this meeting. She's the least likely to have a motive. In all the megayears, she's never been tangled in our little schemes. You two will work together. I think you'll find your skills complementary. She knows technology, but she's a little . . . strange." Yelén was silent again; Wil wondered if he would ever get used to this silent communion between human and machines.

There was movement at the corner of his vision. Wil turned and saw that a third person sat by the table. It was the spacer woman. He hadn't heard a door opening or footsteps. . . . Then he noticed that she sat back from the table, and her seat was angled slightly off true. The holo was better than any he'd seen before.

She nodded solemnly at Yelén. "Ms. Korolev. I'm still in high orbit, but we can talk if you wish."

"Good. I wanted to introduce you to your partner." She smiled at some pri-

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vate joke. "Ms. Lu, this is Wil Brierson. Inspector Brierson, Della Lu."

He'd heard that name before, but couldn't remember just where. The short Asian looked much as she had at the party. He guessed she hadn't been out of stasis for more than a few days: her hair was the same dark fuzz as before.

Lu stared at Korolev for several seconds after she made the introduction, then turned to look at Brierson. If the delay were not a mannerism, she must be out beyond the Moon. "I've read good things about you, Inspector," she said and made a smile that didn't involve her eyes. She spoke carefully, each word an isolated thing, but otherwise her English was much like Wil's North American dialect.

Before Brierson could reply, Korolev said, "What of our prime suspects, Ms. Lu?"

Another four-beat pause. "The Robinsons refused to stop." The library windows showed a view from space. In one direction, Wil could see a bright blue disk and a fainter, gray one—the Earth and Moon. Through the window behind Lu hung a bobble, Sun and Earth and Moon reflected in its surface. The sphere was surrounded by a spidery metal structure, swollen here and there into more solid structures. Dozens of tiny silver balls moved in slow orbit about the central one. Every few seconds the bobbles vanished, replaced by a much larger one that contained even the spidery superstructure. There was a flash of light, and then the scene returned to its first phase.

"By the time I caught up with them, they were off antigravity and using impulse boost. Their flicker rate was constant. It was easy to pace them."

Quack, quack. For a moment, Wil was totally lost. Then he realized he was seeing a nuke drive, *very* close up. The idea was so simple that it had been used even in his time: Just eject a bomb, then go into stasis for a few seconds while it detonated and gave you a big push. When you came out of stasis, drop off another bomb and repeat the process. Of course, it was deadly to bystanders. To get these pictures, Della Lu must have matched the Robinson's bobble cycle exactly, and used her own bombs to keep up.

"Notice that when the drive bobble bursts, they immediately generate a smaller one just inside their defense frame. A battle would have taken several thousand years of outside time to resolve."

Objects in stasis had absolute protection against the outside world. But bobbles eventually burst: If the duration was short, your enemy would still be waiting, ready to shoot; if the duration was long, your enemy might drop your bobble into the sun—and absolute protection would end in absolute catastrophe. Apparently the advanced travelers used a hierarchy of autonomous fighters, flickering in and out of real time. In the microseconds spent out of stasis, their processors decided on the duration of the next embobblement. The shortest period devices stayed in sync with longer period ones, relaying conclusions up a chain of command. At the top, the travelers' command bobble might have a relatively long period.

"So they got away?" Hidden by time and interstellar depths.

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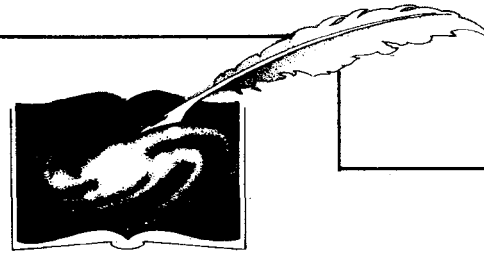

About L. RON HUBBARD'S

Writers of the Future Contest

by Algis Budrys

The Writers of the Future contest substantially rewards at least twelve talented new speculative fiction writers each year. With no strings, every three months it confers prizes of $500, $750 and $1,000 for short stories or novelettes. In addition, there's an annual Master Prize of $4,000. All awards are symbolized by trophies or framed certificates, so there's something for the mantelpiece too.

There's also a Writers of the Future anthology, which I edit. (There was one last year, and there's another one just out as you read this.) It offers top rates for limited rights in the stories. These payments are in addition to any contest winnings. The anthology is distributed through top paperback book retailers everywhere, and is kept in print and on sale continually. All that's required to win or to be a finalist is a good new story, any kind of fantasy or science fiction, no more than 17,000 words long, by writers whose published fiction has been no more than three short stories or one novelette. Entry is free.

The contest deadlines in 1986 are March 31, June 30, and September 30, and there are First, Second and Third prizes for each three-month quarter. At the end of our year, a separate panel of judges awards a Master Prize to the best of the four quarterly winners. So one person will win a total of $5,000. Judging panels include or have included Gregory Benford, Stephen Goldin, Frank Herbert, Anne McCaffrey, C.L. Moore, Larry Niven, Frederik Pohl, Robert Silverberg, Theodore Sturgeon, Jack Williamson, Gene Wolfe and Roger Zelazny, as well as me. Matters are administered so that the judges are totally independent and have the final say.

It seems hardly necessary to embellish the above facts with any enthusiastic adjectives. This contest was created and sponsored by L. Ron Hubbard and the project will continue in 1986 and try to do some realistic good for people whose talent earns them this consideration. For complete entry rules, and answers to any questions you might have, write to the address given below:

Don't Delay! Send Your Entry To:

Writers of the Future Contest
2210 Wilshire Blvd., Suite 343
Santa Monica, CA 90403

Or, you can find the rules—and examples of winning stories, plus informative essays by some of the judges—in either of the Writers of the Future anthologies. They're original paperbacks and cost $3.95 each.

Good luck.

—Algis Budrys

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Pause, pause, pause, pause. "Not entirely. They claimed innocence, and left a spokesman to demonstrate their good faith." One of the windows brightened into a picture of Tammy Robinson. She looked even paler than usual. Wil felt a flash of anger at Don Robinson. Clever it might be, but what sort of person leaves his teenage kid to face a murder investigation? Lu continued, "I have her with me. We should be landing in sixty minutes."

"Good. Ms. Lu, I would like you and Brierson to interview her then." Beyond the windows, forests replaced the black and bright of space. "I want you to get her story before you and Brierson leave for the restart of Town Korolev."

Wil glanced at the spacer. She was strange, but apparently capable. And she was as powerful a witness as he could get. He ignored Yelén's auton, and tried to put the proper note of peremptory confidence in his voice when he said, "One other thing, Yelén."

"Well?"

"We need a complete copy of the diary."

"How—What diary?"

"The one Marta kept all the years she was marooned."

Yelén's mouth clamped shut as she realized he must be bluffing—and that she had already lost the game. Wil kept his eyes on Yelén, but he noticed the auton rise: there was more than one bluff to play here.

"It's none of your business, Brierson. I've read it: Marta had no idea who marooned her."

"I want it, Yelén."

"Well, you can just stick it!" She half-rose from her seat, then sat. "You're the last person I want pawing through Marta's private—" She turned to Lu. "Maybe I could show parts of it you."

Wil didn't let the spacer reply. "No. Where I come from, concealment of evidence was usually a crime, Yelén. That's meaningless here, but if you don't give me the diary—all of it, and everything associated with it—I'll drop the case, and I'll ask Lu to drop the case."

Yelén's fists were clenched. She started to speak, stopped. A faint tremor shook her face. Finally, "Okay. You'll have it. *Now get out of my sight!*"

4

Tammy Robinson was a very frightened young woman; Wil didn't need police experience to see that. She paced back and forth across the room, hysteria sparking from the high edge in her voice. "How can you keep me in this cell? It's a dungeon!"

The walls were unadorned, off-white. But Wil could see doors opening onto a bedroom, a kitchen. There were stairs, perhaps to a study. Her quarters covered about 150 square meters—a little cramped by Wil's standards, but scarcely a punishing confinement. He stepped away from Della Lu, and put his hand on Tammy's shoulder. "These are ship's quarters, Tam. Della Lu never expected to have passengers." That was only a guess, but it felt right. Lu's holdings were compact, built both vertically and horizontally. All the advanced travelers could take their households into space—but Lu's was designed to stay there, to be a home even in solar systems without planets. "You are in custody,

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but once we get to Town Korolev, you'll get better housing."

Della Lu tilted her head to one side, birdlike. "Yes. Yelén Korolev is going to take care of you then. She has much better—"

"*No!*" It was almost a scream. Tammy's eyes showed white all around the irises. "I surrendered to *you*, Della Lu. And in good faith. I won't tell you anything if you . . . Korolev will—" She put her hand over her mouth, and collapsed on a nearby sofa.

Wil sat down beside her as Della Lu pulled up a chair to sit facing them. Lu's black pants and high-collared jacket looked military, but she sat on the edge of her chair and watched Tammy's consternation with childlike curiosity. Wil cast a meaningful look in her direction (as if that would do any good) before continuing: "Tammy, there's no way we'll let Yelén get at you."

Tammy was upset, but she was no fool. She looked past Wil at the spacer. "Is that a promise, Della Lu?"

Lu gave an odd chuckle, but this time didn't blow it. "Yes. And it's a promise I can keep."

They stared at each other a silent moment. Then the girl shuddered, her whole body relaxing. "Okay. I'll talk. Of course I'll talk. That's the whole reason I stayed behind: to clear my family's name."

"You know what's happened to Marta?"

"I've heard Yelén's accusations. When we came out of that strange, overlong bobblement, she was all over the comm links. She said poor Marta got marooned in the present . . . that she *died* there." Frank horror showed on Tammy's face.

"That's right. Someone sabotaged the Korolev jump program. It lasted a century instead of three months, and left Marta outside of stasis."

"And my dad's the chief suspect?" incredulously.

Wil nodded. "I saw your father arguing with Marta, Tam. And later she told me how your family wants the people of Town Korolev to join you. . . . Your plans would benefit if the settlement failed."

"Sure. But we're not some gang of twentieth century thugs, Wil. We *know* we have something more attractive than the Korolev's rehash of civilization. It'll take the average person a while to see this, but given a fair chance they'll come with us. Instead, Yelén's forced us to run for our lives."

"You don't think Marta's been killed?" said Lu.

Tammy shrugged. "No. That would be hard to fake, especially if you," she was looking at Della, "insist on studying the remains. I think Marta was murdered—and I think Yelén is the murderer. Don't you see? All this talk about outside sabotage is just short of ridiculous."

That was certainly Wil's biggest worry. In his time, domestic violence was a leading cause of death. Yelén seemed the most powerful of the high-techs. If she were the villain, life might be short for successful investigators. But aloud: "She's truly broken up over losing Marta. If she's faking, she's very good at it."

Tammy's response was quick. "I don't think she's faking it. I think she

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killed Marta for some crazy personal reason, and terribly regrets the necessity. But now that it's done, she's going to use it to destroy all opposition to the great Korolev Plan."

"Um." He, W.W. Brierson, might be the cause of Marta's death. Suppose Yelén conceived that she was losing her love to another. For some disturbed souls, such a loss was logically equivalent to the death of the beloved. They could murder—and then honestly blame the loss on others. . . . Wil remembered the irrational hatred in Yelén's eyes when he walked into the library.

He looked at Tammy with new respect. She'd never seemed this bright before. In fact . . . he felt just a little bit manipulated. For all her terror, the girl was a very cool character. "Tammy," he said quietly, "just how old are you, really?"

"I—" the tear-streaked, adolescent face froze for a second. Then, "I've lived ninety years, Wil."

Forty years longer than I. Some daughter figure.

"B-but that's not a secret." New tears filled her eyes. "I'd've told anyone who asked. A-and I'm not faking my personality. I try to keep a fresh, open mind. We're going to live a long time, and Daddy says it helps if we grow up slowly, if we don't freeze into adult mindsets like they did in the old days."

The Lu creature gave one of her strange little laughs. "That depends on how long you plan to live," she said to no one in particular.

Brierson suddenly realized that it was wishful thinking to regard himself an expert on human nature. *Once* he had been; now that expertise might be as obsolete as the rest of his knowledge. When he left civilization, life-prolonging medicine had been just a few decades old. At that time, Tammy's deception would have been almost impossible. Yelén Korolev had had about two hundred years to teach herself to lie. Della Lu was so disconnected from humanity, it was hard to make sense of her at all. How could he judge what such people said?

Might as well continue the sympathetic role. He patted Tammy's hand, "Okay, Tam. I'm glad you told us."

She smiled half-heartedly. "Don't you see, Wil? My Dad's a suspect because we disagreed with Marta. We left to protect the family; my staying behind shows we're not running from an investigation. . . . But Yelén is. On the way down, Della Lu told me how Yelén wants you back in stasis right away. She'll be left all alone at the scene of the crime. By the time you two come out, the evidence will be tens of thousands years stale—heck, what evidence there is will've been manufactured by her.

"Now, I brought the family records for the weeks before our party. You and Della Lu should study it. It may be dull, but at least it's the truth."

Wil nodded. It was obvious the Robinsons had their story together. He let the interview go on another fifteen minutes, until Tammy seemed calm and almost relaxed. Lu spoke occasionally, her interjections sometimes perceptive, more often obscure. It was evident that—in itself—clearing the family name was of little importance to the Robinsons. When they were headed, present opinion would be less than dust. But the

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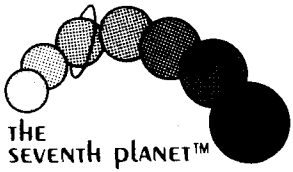

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family still wanted recruits. Tammy's parents were convinced that the people of Town Korolev would eventually realize that settling in the present was a dead end, and that time itself was the proper place for humanity. It might take a few decades, but if Tammy could survive the murder investigation, she would be free to wait and persuade. And eventually she would catch up with her family. Her parents had set a number of rendezvous in the megayears to come. Their exact locations were something she refused to reveal.

"You want to pace your lives, and live as long as the universe?" asked Lu.

"At least."

The spacer giggled. "And what will you do at the end?"

"That depends on how it ends." Tammy's eyes lit. "Daddy thinks that all the mysteries people have ever wondered on—even the Extinction—may be revealed there. It's the ultimate rendezvous for all thinking beings. If time is cyclic, we'll bobble through to the beginning and man will be universal."

"And if the universe is open and dies forever?"

"Then perhaps we and the others can change that." Tammy shrugged. "But if we can't—well, we'll still be there. We will have seen it all. Daddy says we'll raise a glass and toast the memory of all of you who went before." She was still smiling.

And Brierson wondered if this might be the craziest of all his new acquaintances.

Afterwards, Wil tried to plan out the investigation with Della Lu. It was not easy.

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"Was Ms. Robinson distressed at the beginning of the interview?" asked Lu.

Wil rolled his eyes heavenward. "Yes, I believe she was."

"Ah. I thought so, too."

"Look, uh, Della. What Tammy says about Yelén makes sense. It's absurd for the cops—us—to leave the murder scene like this. Back in Michigan, we would have dropped any customer who demanded such a thing. Now, Yelén is right that my hanging around to investigate the physical evidence would be amateurish. But your equipment is as good as hers—"

"Better."

"—and she should be willing to let you postpone bobbling long enough to gather evidence."

Lu was silent for a moment—talking through her headband? "Ms. Korolev wants to be alone for emotional reasons."

"Hmph. She has thousands of years to be alone before the Peacers come out. You should at least do an autopsy, and record the physical evidence."

"Very well. Ms. Korolev is a suspect then?"

Wil spread his hands. "At this stage, she and the Robinsons have to be at the top of our list. Once we start poking around, it may be easy to scratch her. Just now it would be totally unprofessional to have *her* do the field investigation."

"Is Ms. Korolev friendly toward you?"

"Huh? Not especially. What does that have to do with the investigation?"

"Nothing. I'm trying to find a," she seemed to search for the word, "a role model for talking to you."

Wil smiled faintly, thinking back to Yelén's hostility. "I'd appreciate it if you wouldn't model on her."

"Okay." Unsmiling.

If Lu were as smart with gadgets as she was dumb with people, they would make the best detective team in history. "There is something else, something very important, that I need. Yelén has promised me physical protection and access to her databases. I'd like to have your protection, too—at least till we can clear her."

"Certainly. If you wish, I'll manage your jump forward, too."

"I'd like access to your databases." Cross-checking Korolev couldn't hurt.

The spacer hesitated. "Okay. But some of the information isn't very accessible."

Wil looked around Della's cabin—command bridge? It was even smaller than Tammy's quarters, and almost as stark. A small cluster of roses grew from Della's desk; their perfume was heavy in the air. A watercolor landscape hung on the wall facing the spacer. The life tones and shadows were subtly wrong, as if the artist were clumsy . . . or the scene not of this earth.

And Brierson was putting his life in this person's hands. In this universe of strangers, he must trust some more than others, but . . . "How old are you, Della?"

"I've lived nine thousand years, Mr. Brierson. I have been away . . . a long time. I have seen much." Her dark eyes took on that cold, far look he remembered from their first encounters. For a moment, she looked past him, perhaps at the watercolor, perhaps beyond. Then traded the gear to an NM signal offi-

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cer—for a thousand hectare farm. And Korolev didn't object. She did point out which equipment was likely to fail first, and provide databases to those who wanted to plan for the future.

Many of the ungoverned low-techs loved it: survival with profit. Within weeks they had a thousand schemes for combining high-tech equipment with primitive production lines. Both would co-exist for decades, with the failing high-tech restricted to a smaller and smaller role. In the end there wold be a viable infrastructure.

The governments were not so pleased. Both Peacers and NMs were heavily armed, but as long as Korolev stood guard over the Inland Sea, all that the expressionless gaze returned to his face. "I think it's time I rejoined the human race."

5

Some fifty thousand years later, all that was left of the only world empire in history, the Peace Authority, returned to normal time. They were welcomed by Korolev autons, and discouraged from interfering with the bobbles on the south side of the Inland Sea. They had three months to consider their new circumstances before those bobbles burst.

What Marta and Yelén had worked so long for was ready to begin:

Thousands of tonnes of equipment were given to the low-techs along with farms, factories, mines. The gifts were to individuals, supposedly based on their expertise back in civilization. The Dasgupta brothers received two van-loads of communication equipment. To Wil's amazement, they immediately

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twenty-first century might was about as persuasive as the brass cannon on a courthouse lawn. Both had had time to understand the situation. They watched each other carefully, and united in their complaints against Korolev and the other high-techs. Their propaganda noted how carefully the high-techs coordinated the give-away, how restricted it really was: No weapons were given, no bobbler technology, no aircraft, no autons, no medical equipment. "Korolev gives the illusion of freedom, not the reality."

The excitement of the founding came muted to Wil. He went to some of the parties. Sometimes he watched the Peacer or NM news. But he had little time to participate. He had a job, in some ways like his of long ago; he had a murderer to catch. Unless something seemed connected with that goal, it drifted by him, irrelevant.

Marta's murder was a major piece of news. Even with a civilization to build, people still found time to talk about it. Now that she was gone, everyone remembered her friendliness. Every unpopular Korolev policy was greeted with a sigh of, "If only Marta were alive, this would be different." At first, Wil was at the center of the parties. But he had little to say. Besides, he was in a unique—and uncomfortable—position: Wil was a low-tech, but with the perks of a high. He could fly anywhere he wanted; the other low-techs were confined to Korolev-supplied "public" transportation. He had his own protection autons, supplied by Della and Yelén; other low-techs watched with ill-concealed nervousness when those floated into view. These advantages were nontransferable, and it wasn't long before Wil was more shunned than sought.

One of the Korolevs' fundamental principles had already been violated: the settlement was physically scattered now. The Peacers had refused to move across the Inland Sea to Town Korolev. With dazzling impudence, they demanded that Yelén set them up with their own town on the north shore. That put them more than nine hundred kilometers from the rest of humanity—a distance more psychological than real, since it was a fifteen minute flight on Yelén's new transSea shuttle. Nevertheless, it was a surprise that she yielded.

The surviving Korolev was . . . changed. Wil had talked to her only twice since the colony's return to real time. The first time had been something of a shock. She looked almost the same as before, but there was a moment of nonrecognition in her eyes. "Ah, Brierson," she said mildly. Her only comment about Lu's providing him protection was to say that she would continue to do so also. Her hostility was muted; she'd had a long time to bury her grief.

Yelén had spent a hundred years following Marta's travels around the Sea. She and her devices had stored and catalogued and studied everything that might bear on the murder. Marta's was already the most thoroughly investigated murder in the history of the human race. *But only if this investigator is not herself the murderer,* said a little voice in the back of Wil's head.

Yelén had done another thing with the century she stayed behind: she had tried to re-educate herself. "There's only one of us left, Inspector. I've tried

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to live double. I've learned everything I can about Marta's specialty. I've dreamed through Marta's memories of every project she managed." A shadow of doubt crossed her face. "I hope it's enough." The Yelén he'd known before the murder would not have shown such weakness.

So, armed with Marta's knowledge and trying to imitate Marta's attitudes, Yelén had relented and let the Peacers establish North Shore. She'd set up the transSea flier service. She'd encouraged a couple of the high-techs—Genet and Blumenthal—to move their principal estates there.

And the murder investigation had truly been left to Lu and Brierson.

Though had had talked to Korolev only twice, he saw Della Lu almost every day. She had produced a list of suspects. She agreed with Korolev: the crime was completely beyond the low-techs. Of the high-techs, Yelén and the Robinsons were still the best suspects. (Fortunately Lu was now cagey enough not to report *all* their suspicions to Yelén.).

At first, Will thought the manner of the murder was a critical clue. He'd brought it up with Della early on. "If the murderer could bypass Marta's protection, why not kill her outright? This business of marooning her is nicely poetic, but it left a real possibility that she might be rescued."

Della shook her head. "You don't understand." Her face was framed with smooth black hair now. She'd stayed behind for nine months, the longest Yelén would allow. No breakthroughs resulted from the stay, but it had been long enough for her hair to grow out. She looked like a normal young woman now, and she could talk for minutes at a time without producing a jarring inanity, without getting that far, cold look. Lu was still the weirdest of the advanced travelers, but she was no longer in a class by herself. "The Korolev protection system is good. It's fast. It's smart. Whoever killed Marta, did it with software. The killer found a chink in the Korolev defensive logic, and very cleverly exploited it. Extending the stasis period to one century was not by itself life-threatening. Leaving Marta outside of stasis was not by itself life-threatening."

"Together they were deadly."

"True. And the defense system would normally have noticed that. I'm simplifying. What the killer did was more complicated. My point is, if he had tried anything more direct, there is no amount of clever programming that could have fooled the system. There was no surefire way he could murder Marta. Doing it this way gave the killer the best chance of success."

"Unless the killer is Yelén. I assume she could override all the system safeguards?"

"Yes."

But doing so would clearly show her guilt.

"Hmm. Marooning Marta left her defenseless. Why couldn't the murderer arrange an accident for her then? It doesn't make sense that she was allowed to live forty years."

Della thought a moment. "You're suggesting the killer could have bobbled everyone else for a century, and delayed bobbling himself?"

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"Sure. A few minutes' delay would've been enough. Is that so hard?"

"By itself, it's trivial. But everyone was linked with the Korolev system for that jump. If anyone had delayed, it would show up in everyone's records. I'm an expert on autonomous systems, Wil. Yelén has shown me her system's design. It's a tight job, only a year older than mine. For anyone—except Yelén—to alter those jump records would be—"

"Impossible?" These systems people never changed. They could work miracles, but at the same time they claimed perfectly reasonable requests were impossible.

"No, maybe not impossible. If the killer had planned ahead, he might have an auton that didn't appear on his stasis roster. It could have been left outside of stasis without being noticed. But I don't see how the jump records themselves could be altered unless the killer had thoroughly infiltrated the Korolev system."

So they were dealing with a fairly impromptu act. And the queer circumstances of Marta's death were nothing more than a twenty-third century version of a knife in the back.

6

Korolev had delivered Marta's diary soon after the colony returned to real time. Wil's demand for it was one thing that could still bring a flare of anger to her face. In fact, Wil didn't really want to see the thing. But getting a copy, and getting Della to verify that it was undoctored, was essential. Until then, Yelén was logically the best suspect on his list. Now that he had the diary, it was easier to accept his intuition that Yelén was innocent. He set out to read Yelén's summaries and Della's cross-checking. If nothing showed up there, the diary would be a low priority item.

Yelén had sent down an enormous amount of material. It included high resolution holographs of all Marta's writing. Yelén supplied an immense overdoc; Wil could sort the pages by pH if he wanted. A note in the overdoc said the originals were in stasis, available at five days' notice.

The originals. Wil hadn't thought about it: how could you make a diary without even a data pad? Brief messages could be carved on the side of a tree or chiseled in rock, but for a diary you'd need something like paper and pen. Marta had been marooned for forty years, plenty of time to experiment. Her earliest writing was berry juice ink on the soft insides of tree bark. She left the heavy pages in a rock cairn sealed with mud. When they were recovered fifty years later, the bark had rotted and the juice stains were invisible. Yelén and her autons had studied the fragile remains. Micro-analysis showed where the berry stains had been; the first chapters were not lost. Apparently Marta had recognized the danger: The "paper" in the later cairns was made from reed strips. The dark green ink was scarcely faded.

The first entries were mainly narrative. At the other end of the diary, after she had been decades alone, the pages were filled with drawings, essays, and poems. Forty years is a long time if you have to live it alone, second by second. Not counting recopied material, Marta wrote more than two million words be-

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fore she died. (Yelén had supplied him with a commercial database, GreenInc. Wil looked at some of the items in it; the diary was as long as twenty noninteractive novels.) Her medium was far bulkier than old-time paper, and she traveled thousands of kilometers in her time. Whenever she moved, she built a new cairn for her writing. The first few pages in each repeated especially important things—directions to the previous cairns, for instance. Later, Yelén found every one. Nothing had been lost, though one cairn had been flooded. Even there, the reconstructions were nearly complete.

Wil spent an afternoon going through Yelén's synopsis and Della's corresponding analysis. There were no surprises.

Afterwards, Wil couldn't resist looking for references to himself. There were four clusters, the most recent listed first. Wil punched it up:

Year 37.137 Cairn #4 Lat 14.36N
Long 1.01E[K-meridian]
—ask for heuristic cross reference—

was the header Yelén's overdoc printed across the top of the display. Below it, was cursive green lettering. A blinking red arrow marked the reference:

⟨⟨. . . and if I don't make it, dearest Lelya, please don't spend your time trying to solve this mystery. Live for both of us; live for the project. If you must do anything with it, delegate the responsibility. There was that policeman. A low-tech. I can't remember his name. (Oh, the millionth time I pray for an interface band, or even a data set!) Give him the job, and then concentrate on what is important. . . .⟩⟩

Wil sat back, and wished the context searcher weren't so damned smart. She didn't even remember his name! He tried to tell himself that she had lived almost forty years beyond their acquaintance when she wrote these words. Would he remember her name forty years from now? *(Yes!)* To think of all his soul searching, to think how close they seemed that last night, and how noble he had been to back off—when all the time he was just another low-tech to her.

With a quick sweep of his hand, Wil cleared the other references from the display. *Let it lie, Wil. Let it lie.* He stood up, walked to the window of his study. He had important work to do. There was the interview with Monica Raines, and then with Juan Chanson. He should be researching for those.

So after a moment he returned to his desk . . . and jumped the display to the first entry in Marta's diary:

⟨⟨The Journal of Marta Qih-hui Qen Korolev
Dearest Lelya,⟩⟩ it began. Every entry seemed to start that way.

"GreenInc. Question," said Wil. "What is 'Lelya'?" He pointed to the word in the diary. A side display filled with the three most likely possibilities. The first was: "Diminutive of the name Yeléna." Wil nodded to himself; that had been his guess. He continued reading from the central display.

⟨⟨Dearest Lelya,

⟨⟨It's now 181 days since everyone left—and that's the only thing I'm sure of.

⟨⟨Starting this journal is something of an admission of defeat. Till now, I had kept careful track of time and that seemed all that was necessary; you re-

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member we had planned a flicker cycle of ninety days. Yesterday the second flicker should have happened—yet I saw nothing.

⟨⟨So I guess I have to take a longer view. (What a mild way to say it. Yesterday, all I could do was cry.) I've got to have someone to "talk" to.

⟨⟨And I've got a lot to say, Lelya. You know how I like to talk. The hardest thing is the act of writing. I don't know how civilization got started, if literacy involved the effort I've had to make: This bark is easy to find, but I'm afraid it won't age well. Have to think about that. The "ink" is easy, too. But the reed pen I've made leaks and blobs. And if I say something wrong, I can only paint out the errors. (I understand why calligraphy was such a high art.) It takes a long time to write even the simplest things. But I have an advantage now: I have lots and lots of time. All the time in the world.⟩⟩

The reconstruction of the original showed awkward block letters and numerous scratch outs. Wil wondered how many years it had been before she developed the cursive style he'd seen at the end of her diary.

⟨⟨By the time you read this, you'll probably have all the explanations (hopefully from me direct!), but I want to tell you what I remember.

⟨⟨There was the party at the Robinsons. I left early, so mad at Don that I could spit. They've really done us dirt, you know that? Anyway, it was past the Witching Hour and I was walking the forest path we built to the house. Fred was about five meters up, in front of me; I remember the moonlight glinting off his hull.⟩⟩

Fred? The diary's overdoc said that was the auton with Marta that night. Wil hadn't realized they were personalized. You never heard them addressed by name. Come to think of it, that wasn't surprising: the high-techs generally talked to their mechanicals via headband.

⟨⟨From Fred I had a good view over three octaves. There was no one close by. There were no autons shadowing me. It's about at hour's walk up to the house. I had taken longer. I wanted to be cool when I talked to you about Don's little game. I was almost to the great steps when it happened. Fred had no hint. There was a cinnamon burst of static and then he crashed to the ground. It's the most startled I've ever been, Lelya. Our whole lives we've had autons giving us extra eyes. This is the first time I can remember not having *any* warning of a problem.

⟨⟨Ahead of me, the great steps were gone. There was my reflection staring back. Fred was lying at the edge of the bobble. He'd been cut in half by the stasis field.

⟨⟨We've had some rough times, Lelya, like when we fought the grave robbers. They were so strong, I thought the battle might carry us past fifty megayears and ruin everything. You remember how I was after that. Well, this was worse. I think I went a little crazy. I kept telling myself it was all a dream. (Even now, six months later, that sometimes seems the best explanation.) I ran along the bobble's edge. Things were as peaceful and silent as before, but now the ground was treacherous beneath my feet and branches clawed at me. I didn't have Fred to be my high eyes. The bobble was hundreds of meters across. It

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met the ground just beyond the great steps. It didn't cut through any large trees. It was obviously the bobblement we'd planned for the property.

⟨⟨Well, if you're reading this, you already know the rest. The Robinsons' place was bobbled. Genet's was bobbled. It took me three days to hike across all of Korolev Town: everything was bobbled. It looked exactly like the jump we'd programmed except for two things: (1) (obviously) poor little Marta had been left outside, and (2) all automatic equipment was *in* stasis.

⟨⟨Those first weeks, I could still hope that every ninety days the stasis would flicker off while the autons checked the Peacer bobble. I couldn't imagine how all this had happened (I still can't) yet it might turn out to be one of those stupid mistakes one can laugh about afterwards. All I had to do was stay alive for ninety days.

⟨⟨There's damn little outside stasis, Lelya. There was no question of salvaging Fred. Looking at that compact pile of junk, I was surprised how little I could do with it—even if his power supply had been on my side of the bobble. Monica Raines is right about one thing; without autons, we might as well be savages. They are our hands. And that's not the most horrible part: without processor and db support, I'm a cripple, my mind stuck in molasses. When a question occurs to me, the only data is what's wedged in my own gray matter. The only eyes I see from are my own, fixed in space and time, seeing only a narrow band of the spectrum. To imagine that before our time, people lived their whole lives in this lobotomized state! Maybe it helped that they didn't know anything better.

⟨⟨But Monica is wrong about something else: I didn't just sit down and starve. All my time in survival sports paid off. The Robinsons had left a pile of trash just on our side of the property line. (That figures.) At a glance you might not think there was much worthwhile: a hundred kilos of botched gold fittings, an organic sludge-pond that made me want to puke, and—get this—a dozen cutter blades. So what if they've lost their micrometer edge? They're still sharp enough to cut a hair lengthwise. They're about half a kilo each, single diamond crystals. I lashed them onto wood shafts. I also found some shovels on a pile of rock ash in town.

⟨⟨I remembered the large carnivores we spotted coming in. If they're still around, they've lying low. After a couple of weeks, I was beginning to feel safe. My traps worked, though not as well as on a sport trip; the wildlife hasn't recovered from the Peacer rescue. Just as we'd planned, the south gallery of the house was left out of stasis. (Remember how you thought it hadn't aged enough?) It's all naked stone, stairs and towers and halls, but it makes good shelter—and parts are easy to barricade.

⟨⟨I didn't remember how long the lookabout would last, so I decided to hit you over the head with my message. I lashed a frame between the trees at the bottom of the great stairs. I spread bark across the framework and used wet ash to spell HELP in letters three meters high. There's no way it could be missed by the monitor on top of the library. I had the sign done a good week ahead of time.

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⟨⟨Day ninety was worse than waiting for the judge's call in arbitration. No day ever seemed so long. I sat right by my sign and watched my reflection in the bobble. Lelya, *nothing happened.* You aren't on a three month flicker or the monitor isn't watching. I never hated my own face as much as I did that day, watching it in the side of the bobble.⟩⟩

Of course, Marta had not given up. The next pages described how she had built similar signs near the bobbles of all the advanced travelers.

⟨⟨Day 180 just passed, and the bobbles still sit. I cried a lot. I miss you so. Survival games were fun, but not for ever.

⟨⟨I've got to settle down for the long haul. I'm going to make those billboards sturdier. I want them to last at least a hundred years. How long can *I* last? Without health care, people used to live about a century. I've kept my bio-age at twenty-five years, so I should have seventy-five left. Without the databases I can't be sure, but I bet seventy-five is a lower bound. There should be some residual effect from my last medical treatment, and I'm full of panphages. On the other hand, old people were fragile, weren't they? If I have to protect myself and get my own food, that could be a factor.

⟨⟨Okay. Let's be pessimistic. Say I can only last seventy-five years. What's my best chance for getting rescued?

⟨⟨You can bet I've thought about that a lot, Lelya. So much depends on what caused this catastrophe—and all the clues are on your side of the bobble. I've got ideas, but without the databases I can't tell what's plausible.⟩⟩ She went on to list the string of unrelated errors that would be necessary to leave *her* outside and all the autons inside, and to change the flicker period. Sabotage was the only possible explanation; she knew that someone had tried to kill her.

⟨⟨I'm not lying down to die. I can't think technical anymore, but I'll bet you still have a fairly short flicker period. Besides, we have gear lots of other places: at the Lagrange zones, the West End mines, the Peacer bobble. With luck, there will be lookabouts in the next seventy-five years. And didn't we leave autonomous devices in real time in Canada? I think there's a land bridge to America in this era. If I can get there, maybe I could make my own rescue.

⟨⟨So most of the time, I'm optimistic.

⟨⟨But suppose I don't make it? Then I'm the murder victim, and some kind of witness, too. Even though you'll never get Fred's record of the Robinsons' recruiting party, you'll hear about it elsewhere. That's the only clue I have.

⟨⟨Don't let them break up our settlement, Lelya.⟩⟩ ■

CONTINUED IN NEXT ISSUE

● The Earth is the cradle of human civilization, but one cannot live in the cradle forever.

Konstantin Tsiolkovskii

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a calendar of analog upcoming events

2-4 May
GALACON II (multimedia conference) at the Holiday Inn, Norfolk, Va. Guest Author—Joe Haldeman, Fan Guests—Jerry Harrell and Kay Reynolds, Musical Guests—John Cog and Robin Welch, Guest Artists—Colleen Doran and Allen Rowe. Registration—TBA. Send three S.A.S.E. with *each* paid registration. Info: Galacon, Box 8726, Virginia Beach VA 23450-8726. (804) 340-9349. Registration limited to 1200.

16-18 May
CONQUEST 17 (Kansas City area SF conference) at Howard Johnson Motor Lodge, Kansas City, Mo. Guest of Honor—Tim Powers, Fan Guest of Honor—Ann Layman Chancellor, TM—Ed Bryant. Registration—$14 until 15 April, $16 at the door. Info: Conquest, Box 36212, Kansas City MO 64111.

16-18 May
MARCON 21 (Ohio SF conference) at the Sinclair Plaza, Columbus, Ohio. Guest of Honor—Roger Zelazny, Artist Guests of Honor—Kelly and Polly Freas, TM—Andrew Offutt, Musician—Bill Maraschiello, Fan Guest of Honor—Murray Porath. Registration—$18 until 15 April, $20 thereafter. Info: Marcon, Box 14078, Columbus OH 43214-0078. (614) 475-0158.

23-25 May
CONJURATION III (Oklahoma SF conference) at the Hilton Hotel, Tulsa, Okla. Guest of Honor—Christopher Stasheff, Artist Guest of Honor—Keith Berdak, TM—Ron Goulart. Registration—$9.50 until 22 May, $12.50 at the door. Info: Conjuration III, Box 690064, Tulsa OK 74169.

23-25 May
KUBLA SILICON (Tennessee SF conference) at the Sheraton-Nashville Hotel, Nashville, Tenn. Guests of Honor—Timothy, Anna, and Corwin Zahn, Artist Guest of Honor—Victoria Poyser, MC—Andrew Offutt. Registration—$14 until 1 May, $18 thereafter. Info: Ken Moore, 647 Devon Drive, Nashville TN 37220.

23-25 May
V-CON 14/CANVENTION 6 (Canadian national SF convention) at Totem Residence, University of British Columbia, Vancouver, B.C. Special Theme: Transportation and Communication. Guest of Honour—Frederik Pohl, Fan Guests of Honour—Beth & Mike Finkbiner, Artist Guest of Honour—Katherine Howes, Special Guest—Eileen Kernaghan, TM—Randy Reichardt. Registration—$18 until 15 May, $20 at the door. Caspar Awards will be presented. Info: Box 48478, Bentall Centre, Vancouver BC, CANADA V7X 1A2.

24-26 May
AMIGOCON (Trans-Pecos area SF conference) at the Holiday Inn Mid-City, El Paso, Tex. Guest of Honor—Patricia McKillip, Special Guest—Robert E. Vardeman. Registration—$10 in advance, $15 at the door (one day admission $6). Info: Tom Cagle, 3400 Polk, El Paso TX 79912.

29 May-1 June
LEPRECON 12 (Phoenix area SF conference) at the Ramada Inn Airport North, Phoenix, Ariz. Guests of Honor—Kim Poor, Donald and Elsie Wollheim, Peggy Crawford. Registration—$17 until 1 May, $20 thereafter. Info: Leprecon, Box 16815, Phoenix AZ 85011.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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FERMI PARADOX— THE FINAL SOLUTION?

Duncan Lunan

Enrico Fermi is said to have formulated the paradox which bears his name over dinner. "Where is everybody?" he asked, referring not to his fellow diners, nor the waiters, but to the guests from beyond the Solar System who might have been expected. Given the relative youth of mankind compared to the Earth, and the relative youth of the Solar System compared to the Galaxy, why was Earth not already part of a galactic civilization—frequently visited, if not settled and developed, by advanced star-faring races?

Until now the answer you preferred depended on the optimism you felt about the human race, since there weren't any other high-technology species around to

A cylindrical space habitat with a Daedalus engine at the rear. In order to make the structure mobile, the agricultural and industrial units that would normally be grouped around the cylinder have been integrated into "wings" built out from it. Shielded against galactic radiation, such "mobile worlds" would be able to penetrate Jupiter's radiation belts to extract Daedalus propellants from Jupiter's atmosphere. Europa is crossing the face of the planet and Ganymede is near the equatorial ring. The artist assumed that the color of the Red Spot will continue to fade as it has done during the 20th century.

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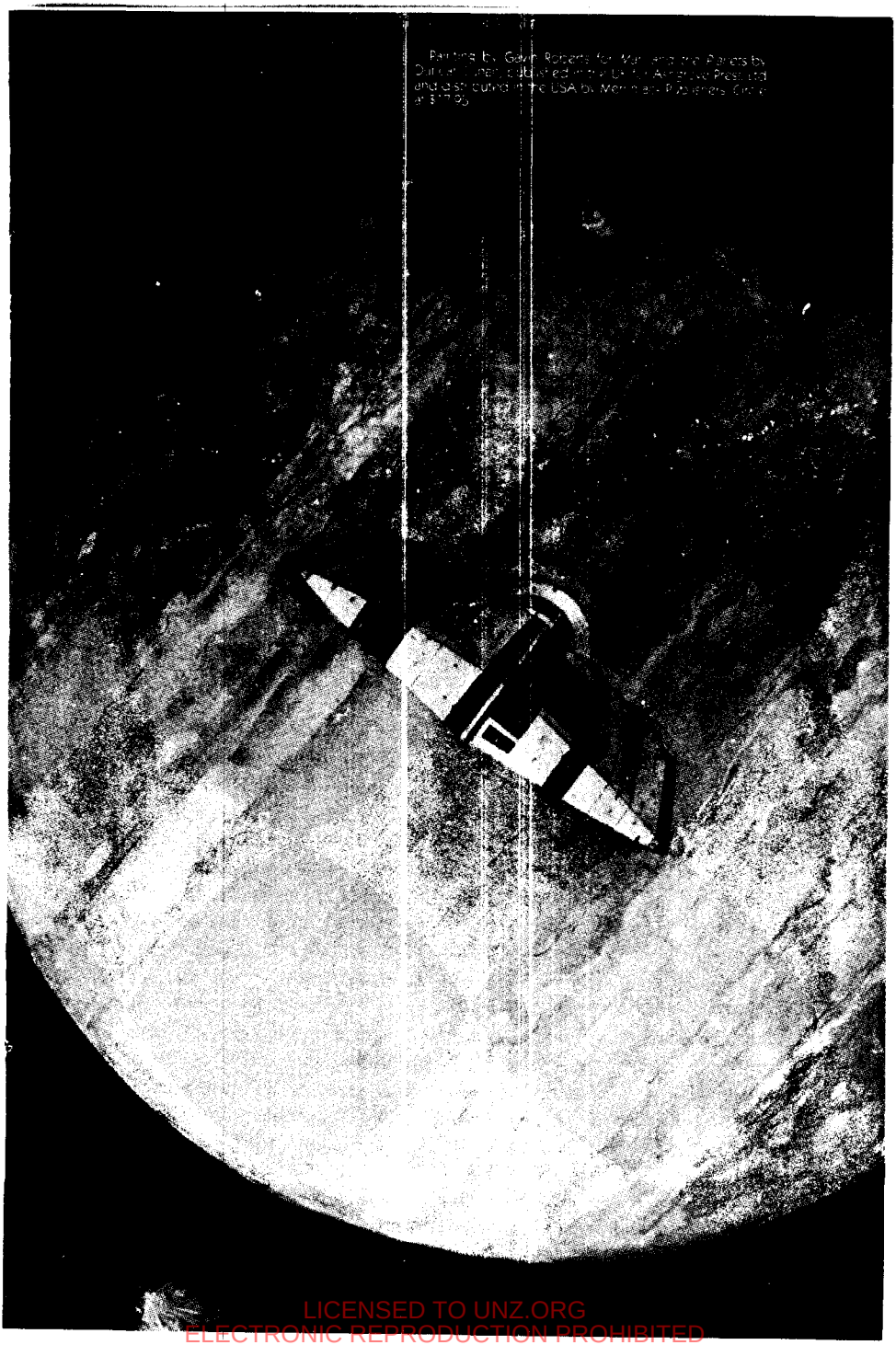

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study. It was all too easy for pessimists and cynics to conclude that high-technology civilizations destroy themselves in a few decades or centuries at most, just as (they argued) our own was bound to do. A view much favored by astronomers has been that interstellar travel is simply impossible, and relatively little attention is paid in astronomical circles to the spaceflight engineers (such as the British Interplanetary Society's "Project Daedalus" design team) who maintain that starship building will be within our capabilities in a matter of decades. An outwardly more sophisticated and optimistic hypothesis is that advanced civilizations *choose* not to go interstellar, communicating by radio or laser beams instead; and an intermediate view is that the physical exploration of the Universe is the task of "von Neumann machines," self-replicating automated space probes.

Gerry Webb of Project Daedalus believes that the human race itself is divided into "starship-building man" and "television-watching man." The "starship-building" theorists believe that we shall soon be able to do just that, and what we can do, others may well have done before. This implies that the Earth has probably already been visited. One interesting if jaundiced view (advanced by David Brin) is that advanced civilizations *do* destroy themselves, but on a time-scale which allows them to colonize the Galaxy first, then yield to catastrophe planet by planet. The "megadeaths" in Earth's evolutionary record might be the side-effects of pollution, wars, or industrial accidents whereby occupations of the Earth had come to an end. The most optimistic view is the "Zoo Hypothesis," which holds that because Earth is already a life-bearing world, interstellar travellers with conservationist attitudes elect to leave it alone. Some years ago, in a paper entitled "Are Humans a Protected Species?" I argued that the numbers (age of mankind, age of the Earth, age of the Galaxy, numbers of stars) imply that either we are one of the very first spacefaring cultures in the Galaxy, or else almost certainly we have been visited and assessed.

Quite suddenly and on the very day that I write this, the picture has changed radically. It seems that the history of settlements in space and on non Earth-like worlds, perhaps for culture after culture during the history of the Galaxy, may have ended in tragedy. It has become very much less likely that Earth has ever been visited from outside, or ever will be. And it looks as if we as a spacefaring species have had a particularly bad break, right at the outset; and yet, paradoxically indeed, as if we may as a result be the first spacefaring culture to survive *as such* and so inherit the Galaxy. The explanation of the Fermi Paradox appears to be a menace more feared in bad fiction than in reality: cosmic rays.

"Cosmic rays" are misleadingly named. Radiation along the entire electromagnetic spectrum does indeed fall upon the outer atmosphere of the Earth, and almost all of it—gamma rays, x-rays, most of the ultraviolet, much of the infrared and most of the radio spectrum—is stopped by the atmosphere before it reaches the ground. But the

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"cosmic rays" first detected on balloon flights early this century are *particle radiation*: atomic nuclei, traveling through space at high velocities. From these, too, the Earth's atmosphere protects us.

Ongoing research made it possible to distinguish between particle radiation from the Sun and truly "cosmic" rays—nowadays often called "galactic cosmic radiation"—from interstellar space. The Solar Wind is a steady outward flow of charged particles from the Sun, mostly hydrogen and helium nuclei, and when these hit the Earth's magnetic field they are deflected into the Van Allen radiation belts. Particle counts and energies reach dangerous values only during the violent processes of a solar flare, when the nuclei energized and channeled in the flare's magnetic field form a shock front in the interplanetary medium. Often when one of those hits us the Van Allen belts are saturated, and particles leaking into the atmosphere around the poles produce auroral displays and magnetic storms. Spacecraft orbiting below the Van Allen belts in orbits near the equator are still relatively safe, but a flare storm during an Apollo lunar mission would have been a major hazard. On the NERVA manned Mars missions once planned for the 1980s, there would have been emergency "storm cellars" among the cargo into which the crew could retreat. (Such a crisis is dramatically portrayed in Gordon Dickson's novel "The Far Call.")

However, on the lunar missions the Apollo crews reported mysterious bright flashes within their eyes. Studies on the later missions, correlated with the results from "Biostack" packages of cell tissue and radiation detectors, established that the flashes were caused by high-energy galactic cosmic rays passing through the eyes—it was even possible to tell whether the particles had come from in front, or behind, passing right through the brain. Such an event isn't particularly dangerous on its own because the particle's energy is so high that it simply leaves a trail of dead cells behind it; strangely enough a thicker cabin wall would increase the danger, because a particle hitting an atom releases a shower of slower-moving, less massive particles, affecting many more cells, damaging them rather than killing them, possibly generating mutations and cancers.

On long-term missions, however, the problem is the cumulative damage to central nervous tissue, which does not regenerate. It was estimated that in two weeks the astronauts typically lost one hundred-thousandth of their central nervous systems, and an accumulated dosage over three years—a little longer than a Mars mission—would show measurable effects in the way of loss of memory, slurred speech, impaired vision, and poor coordination. Long-stay or permanent settlements such as space habitats, lunar bases, colonies on Mars and most other planetary bodies, would require shielding by at least five meters of rock or an equivalent mass per unit area. Otherwise, even adults would be at risk and the effect on growing children, or embryos in the womb, hardly bears thinking about. Yet in another few paragraphs we shall have to.

The London *Sunday Times* of 3rd

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February 1985 carries on page 13 an article by Bryan Silcock entitled "Space Rays: a Starry Birth." It describes research at the University of Kiel in West Germany, confirmed at Durham University in England, seeming to pinpoint the origin of galactic cosmic rays. That can't be done directly because of their scattering by the Galaxy's magnetic field; but it is possible for gamma rays, and very high energy gamma rays have been found to come from an x- and radio- wave source named Cygnus X-3, at a distance of 30,000 light-years. Fluctuations in the intensity of the gamma-ray flux with a period of 4.8 hours were correlated with those of the x- and radio emission. Cygnus X-3 is believed to be a binary system with a neutron star as the close companion; the precise mechanism by which the system might generate cosmic rays has still to be suggested, but the energies available for the launch of nuclei into the void are enough to account for the numbers and energies of the galactic cosmic rays measured at this distance. As Cygnus X-3 is in an evolving phase, the period during which high-energy cosmic rays were generated may have been as little as a hundred years, and there would probably be no more than one such star *at most* active in the Galaxy at any given time. The particles from Cygnus X-3 just happen to have been hitting the Earth during the history of flight in the atmosphere and in space so far; for long periods of time, high-energy cosmic rays would be unknown here. An unlucky break for us, you might think, until you realize what might have happened otherwise.

A despairing onlooker once wrote that "the trouble with the space age is that prophecy gets to be history before it becomes current fact." The literature and art of space flight are full of examples; for instance, the famous *Collier's* symposium of 1952 featuring a wheel-type space station orbiting 2000 miles up—right in the most intense zone of the Van Allen belts, as it turned out. Anyway, the rotation effects would have been dizzying in a wheel of that size. It's taken longer for the realization to sink in that, now that we know the effects of cosmic radiation, pressurized domes of metal or plastic on the surfaces of the Moon, Mars, or the asteroids can only be used for short stays at most; long-stay bases or permanent settlements will have to be underground, and deep-space ships designed for months or even years in transit are unsafe for adults and deadly for children.

1970s and 80s studies of space habitat design have taken full account of the radiation hazard. But it's been assumed that full Earth gravity has to be simulated, so the structure has to be a kilometer or more in radius and shielding mass runs into millions of tons. In my book *Man and the Planets,* I pointed out that no other solid body in the Solar System has the surface gravity more than one-third of Earth's—except for Venus, and we won't be homesteading *that* surface for a while! If we settled on a quarter-g as a good average, giving acclimated occupants access to everything except Earth and Venus, then we would go back to Gerard O'Neill's original design for cylindrical habitats 200 meters across, and to Gregory Matloff's proposal to make them mobile using

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Daedalus engines.

Project Daedalus was the title of the British Interplanetary Society's design study of an unmanned space probe intended to reach Barnard's Star with a flight time of 60 years. The engine would run on pulsed nuclear fusion (triggered by converging electron beams) of pellets of frozen deuterium enclosing liquid helium-3. It would take 50,000 tons of propellant to accelerate the probe to its interstellar velocity of 12% of lightspeed. But that means that the 50,000 ton vehicle could go from here to Mars (including braking) in five days, for just 200 tons of propellant—and a five million ton habitat could make the same trip for the same expenditure in under a year! When I first worked this out I couldn't believe it, so I checked with Gerry Webb of the Daedalus team. "Yes," he replied, "within the Solar System, Daedalus is pure Flash Gordon in its potential." Furthermore, habitats armored against galactic radiation can brave Jupiter's radiation belts with impunity: they can 'mime' the Daedalus propellants from the planet while in close orbit, much more efficiently than the Callisto-based operation which the Daedalus team proposed.

With access to *those* resources in bulk, the era of the mobile world truly arrives. Habitats can be out in the cometary halo in 200 years or less, at Alpha Centauri in 400 years, and spread throughout the Galaxy in 10 million years at most. To be compact enough to be mobile, the habitats have to be cylinders and therefore spinning relatively slowly, so their components won't be acclimated to Earth surface-equivalent gravity; but there isn't another solid body in the Solar System with a surface gravity as high as that, and when we reach other systems, we don't want to take over Earth-like worlds anyway.

When I wrote *Man and the Stars* (US edition *Interstellar Contact*) in the early '70s, one of the points to emerge was that integrating a terrestrial colony into the biosphere of another Earth-like world would be so demanding a task, that faster-than-light links with Earth would be needed for personnel and resources. Mobile worlds, however, can be conservationist and leave other Earths aside; they can use the resources of asteroids and moons to create more habitats, Earth-like inside to whatever extent they wish. FTL travel, impossible as far as we know, is no longer necessary to spread the human race across the Galaxy.

But if there were no cosmic radiation problem, how would things be? The question is easy to answer: one has only to look at the space literature and artwork of the last 55 years, since Tsiolkovsky, Oberth, and Goddard independently worked out the basics of astronautics. Surface bases on the Moon, the planets and their satellites, and the asteroids, would grow into surface cities. Cramped "storm cellars" for solar flare events would give way to magnetic or electrostatic shields, and to nonmetallic protective shells where manufacturing was on-site. Small interplanetary spaceships would grow into large interplanetary transports and liners, and they in turn would grow into interstellar "space arks"—smaller and probably faster than mobile worlds, because they

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wouldn't have to carry millions of tons of rock shielding or to have comparably thick concrete hulls. If they carried thousands of people to interstellar colonies, most of them might be in suspended animation, but even "generation ships" would probably be much smaller than mobile hatitats. Earth-like conditions on the voyage would be traded for trip times of decades rather than centuries.

The literature also includes a partial picture of what would happen when such a spacefaring culture was hit for the first time by high-energy cosmic rays. In his book *Journey to Alpha Centauri* (second edition *How We Will Reach the Stars*) my friend John Macvey closed with a dramatized account of a multi-generation interstellar voyage, told from the diaries of one of the "First Families." It includes a heroic battle for survival against a previously unknown "delta radiation" which penetrates the ship in interstellar space. What John's touching account with its sad/happy ending doesn't include, however, is the selective effect which an unexpected high-energy cosmic ray flux would have on children and embryos. The design of the ship might allow those most at risk to shelter at its core, along with essential personnel—but that scenario is well known, it leads toward the cultural breakdown of Heinlein's "Orphans of the Sky." People in suspended animation would be as much at risk as those awake. There is a means of electrostatic shielding against galactic radiation, considered by the designers of the "Stanford torus" space habitat, in 1975; but it requires highly specialized design, including an evacuated core for the structure. It's doubtful that a ship in flight could be so drastically modified.

To take any steps one has to recognize the hazard. Light flashes in the eyes are experienced by astronauts in Earth orbit but they weren't recognized as significant until the lunar missions; and since the high-energy cosmic ray was a well-known phenomenon, the connection was very quickly made. To a race that had been in space for centuries or even millenia without encountering them, the effect would take longer to recognize and the explanation longer to establish. And *that* assumes the kind of cosmic radiation flux we have here, 30,000 light-years from Cygnus X-3. The radius of the Galaxy is only 50,000 light-years and as the radiation from an event like Cygnus X-3 spreads through it, any and all spacefaring civilizations will be hit. For some the light flashes will be less frequent and the damage will be further advanced before what's happening is recognized; horrifically, for others the flashes will come on with the frequency sometimes experienced in migraine attacks—except that in this case, every flash will represent another line of cells electrocuted right across the brain.

Perhaps the worst of it, especially since the effect lasts for only 100 years or so, is that the farther a civilization has spread into space the more severely it will be hit. On a starship in flight the problem is particularly acute because of the isolation, but the same things are happening in every long-stay installation which isn't protected by a thick atmosphere or a thick layer of rock. The

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higher the population living off the homeworld, the harder it will be for them to evacuate or go underground in time. The older images of space development are all turned into images of ruin: bubble cities collapsing, starships plunging through their destination systems unchecked, industrial space cities drifting off-station as their incoming raw materials sail past unclaimed, empty domes on half-mined asteroids. There will be spaceships whose metal hulls turn their interiors into death-traps of crisscrossing secondary radiation. But perhaps the worst thought of all is the dying of intelligence behind millions of intermittently dazzled but despairing eyes.

In a century it is over. Those who were protected, of found protection in time and in sufficient numbers to remain self-sufficient, may start to rebuild. Homeworlds and colonies on worlds with thick atmospheres will be untouched by the blight; but the more advanced their spacefaring activities and the greater their dependence on imports from space, the worse the deprivation to be endured. When a return to space is proposed, the reaction may be far worse than our present society's fear of airships. If their emotional makeup is like ours, one of the biggest factors will be that the disaster took its earliest toll of the young and the unborn. Many societies if not all will opt for a return to a ground-based, primarily agricultural economy.

If Cygnus X-3 and the galactic cosmic rays are really what they now appear to be, then we must accept that such things have happened to the earlier spacefaring races in the Galaxy—quite possibly to all of them. For a 100 light-year deep radiation shell to be passing us, 30,000 light-years from its source, just in the century that we happen to develop spaceflight, the odds are 300:1 against even if there's one such radiation source in the Galaxy at a time, and greater if the events are still more rare. For it to happen to us if we were the first spacefaring race in the Galaxy would be a stroke of luck beyond belief. The converse is that almost certainly there were other spacefaring races before us, virtually doomed from the outset because their chances of long-term survival were actually one in three hundred or worse. I didn't mention at the outset the least imaginative answer to the Fermi Paradox, namely that we're simply alone in the Universe, because now it seems we can't be. Lucky, yes; very, *very* lucky, because our installations in space will be fully protected; but not so lucky that the Universe would give us that break if we were the first spacefarers around.

The famous expression of the number of high-technology civilizations in the Galaxy is the Drake equation, or Green Bank Formula, whereby

$$N = r_s f_s f_p f_e f_l f_i f_c L$$

where N is the number of civilizations capable of interstellar communication, r_s is annual rate of star formation, and the "f" terms are the fractions of stars that are like the Sun, that produce planets, planetary systems that have Earth-like worlds, fractions of those which produce life, intelligent life, and communicative technology—all multiplied by L, which is the average lifetime of a communicative civilization. In

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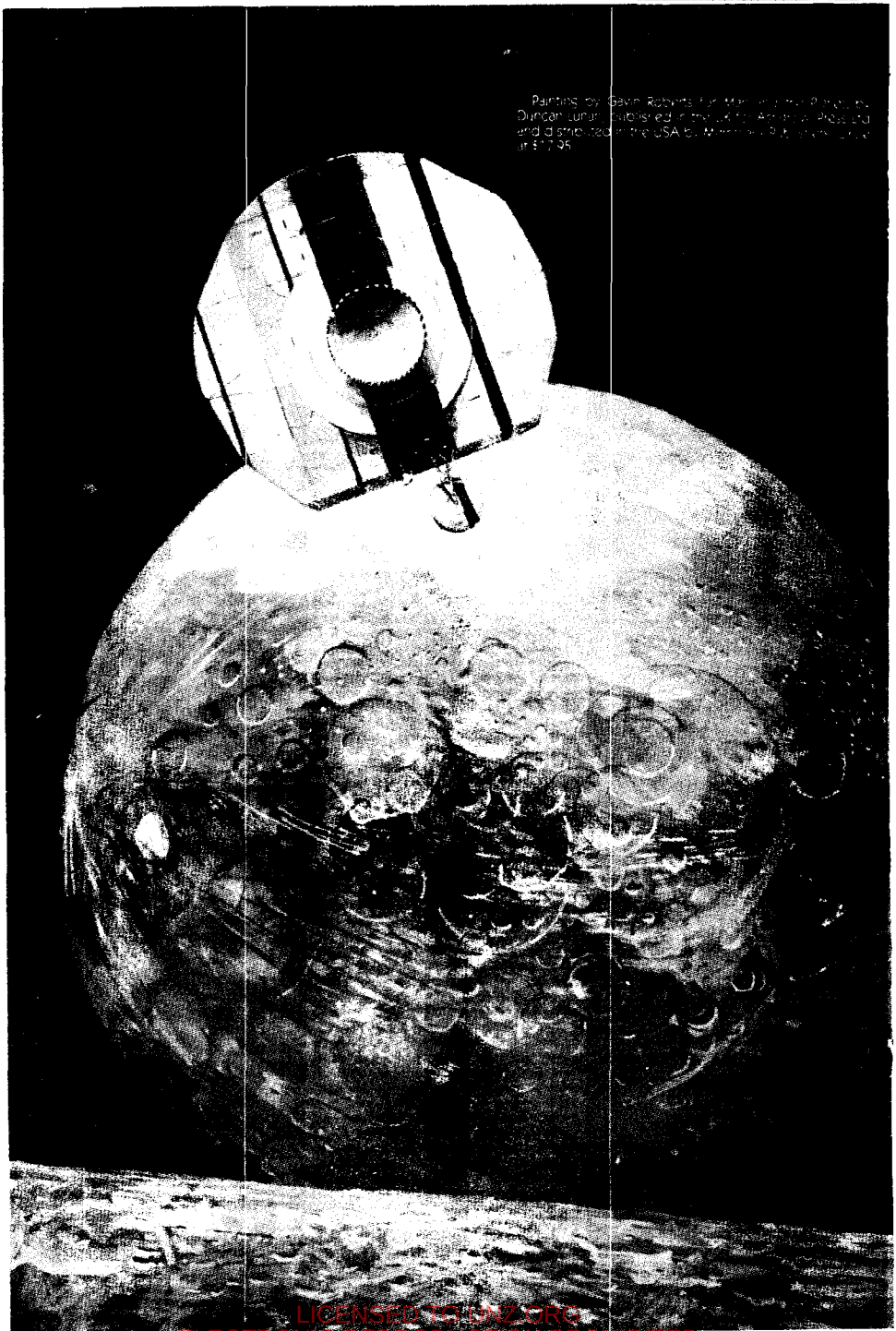

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"Are Humans a Protected Species?" I pointed out that as all the "f" terms are assumed to have a certain numerical value, they can be multiplied together to give a constant, K_1; and since N is assumed to be constant over long periods of time, it can be divided by K_1 to give another constant, K_2. We then find that

$$L = K_2/r.$$

which is to say the equation assumes that over long periods of time civilizations die out, in widely separated parts of the Galaxy and (I thought) for different reasons, at a rate that is proportional to the number of stars formed per year. Unless a reason could be found for such a state of affairs, one might just as well say that the lifetimes of civilizations are *not* related to the rate of star formation, and forget the Drake equation altogether. But now we can see such a possible explanation. Out of all the stars formed in a long enough period of time, statistically one at least will be bound to go through the evolutionary sequence we now observe at Cygnus X-3. We would appear to be the first space-faring culture to have beaten the odds.

Let's close therefore not with the tragedies of the past but with the bright prospects for the future. There is now no reason to believe that we are alone in the Universe, nor that high-technology civilizations destroy themselves. Instead we seem to be heading into a situation, in a Galaxy near at hand and in the immediate future, in which like the background to the *Star Wars* movies we have lots of Earth-like planets, quite a number of intelligent extraterrestrial races, but we are virtually the only people around currently possessing space ships. Let's just hope that we don't discover faster-than-light drives and become tempted by the prospect of interstellar empire.

Nor do we have to give up the hope of early Contact altogether. There is still the possibility that any of those space-faring cultures before it fell launched self-replicating von Neumann probes ahead of its own relatively slowly expanding frontiers. Given that von Neumann probes from a single starting point could explore the whole Galaxy in 1 to 10 million years, Chris Boyce argued in his book *Extraterrestrial Encounter* that there could already be a "college" of von Neumann probes in the Solar System, waiting for us to pass some agreed emergence criterion before they make contact with us. If that were the common experience of emerging cultures, however, then presumably they would be told by the probes about what had happened before. Perhaps then tragedy ceased to be a universal experience after the launching of the first von Neumanns, and preventing it became their main purpose. If that is the case, and the first message is a warning of a hazard we already appreciate, let's not be too quick to congratulate ourselves before we find out what the price of that knowledge was for others. ■

A large mobile habitat, showing the Daedalus engine bell and thermal/radiation shielding. Here the "wings" have been built out into a complex polygonal structure providing a variety of "gravity" values for industrial processing, as well as extra propellant tankage. The imaginary outer planet moon in the background resembles Ganymede, having grooved terrain and larger, older craters partly erased by surface movements; but it has less surface ice visible.

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Probability Zero

THE ROYAL VISIT

John Gribbin

The arrival of the advance guard for the visit of His Galactic Highness the Prince Mackintosh could hardly have occurred at a more propitious time in the history of the Earth. The prince wasn't really a "prince," of course, and his actual name was unpronounceable in any terrestrial dialect. Yet his title carried with it an implication of one born to rule, while his name implied the role of a great protector, shielding "his" people against trouble falling from the skies. So, "Prince Mackintosh" seemed as good a translation as any.

Whatever you called him though, as I was saying, his timing, or that of his team was remarkable. The first salvo of missiles from the Western Hemisphere was in flight over the Arctic, having been triggered by a computer error in the early warning system, and the response from the East was just leaving its hardened silos and accelerating upward on a series of reciprocal paths when the saucers appeared over the capital cities of most of the industrialized nations of the globe, and in a good few other places as well.

A somewhat startled world population was treated to the simultaneous appearance, on all communications channels, of the plenipotentiary of the Prince, as he addressed the United Nations in particular and the people of the world in general. The sight itself wasn't too disturbing, since the plenipotentiary had been genetically engineered to look like an adult human male, and spoke impeccable English.

"People of Earth," he said in that immortal sentence, "we wish you no harm." And he went on to explain that the Prince Mackintosh, involved in arduous royal duties in this neck of the galactic woods, intended to take a breather, and that Earth provided the most convenient planetary oasis for his respite between official works. In order to ensure the maximum comfort to their reverend father (the speaker's

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references to his leader [employer?] tended to a certain vagueness) the plenipotentiary and his colleagues had been sent on ahead to prepare the way, making camp, as it were; and to ensure the minimum discomfort for the Prince during his stay, which would be brief, by removing certain uncomfortable features of the planet.

To that end, the plenipotentiary explained apologetically, certain ballistic devices had already, as the viewers may have noticed, been removed. And there would be a few other changes—nothing permanent, and nothing intended to be detrimental, but the Prince was a sensitive soul, and what he sought was an aura of peace and calm during his visit.

That was the last anyone saw of the plenipotentiary for a full twelve months, although the saucers were to be seen busily flitting about the world, disappearing here and reappearing there, seemingly at random.

As the stunned surprise of what they had just seen, and the awesome power it implied, began to wear off, it was replaced by something akin to euphoria. Relief that accidental nuclear war had been averted soon developed into treaties of peace and friendship, with the immediate dismantling of existing weapons of destruction. Military vehicles were hastily given over to the task of distributing supplies of food from the granaries of Europe and North America to the hungry of the Third World, while grandiose plans were laid for international cooperation on future projects to ensure that no one went hungry again. People started being nice to one another. The incidence of crimes of violence dropped dramatically; nobody seemed to get seriously ill any more; and in hospitals around the world doctors and surgeons stood by in amazement as the terminally ill experienced spontaneous reversals of their diseases and left to start their lives again. In the whole of the 12 months following the first appearance of the saucers, only 247 people died in the whole world, all of them in accidents.

For obvious reasons, this development posed the only long term cloud on a seemingly blue horizon as the UN met once again to discuss the continuing task of beating swords into plowshares. Then, for the second and last time, the Prince's plenipotenitary hijacked all communications channels. He expressed his thanks to the world for their forebearance; the Prince's visit, though brief, had enabled him to taste the life force on the planet, and had returned him revitalized to his work. Of course, the planetary life forms had suffered some inconvenience and disruption of their usual routine; by removing, temporarily, the sources of more abrasive vibrations in the life aura around the planet, the plenipotentiary was aware that he had intruded upon long established practices, for which he apologized. But, in recognition of the valuable service provided for the Prince, "everything," said the plenipotentiary in his second memorable sentence, "will now be restored to the state in which we found it." And that solved, at a stroke, the last problem the United Nations had to face: the population problem. ■

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Rob Chilson

BRAIN IN A POCKET

Which came first: the cripple or the crutch?

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Eleven anonymous dissertations lay on the table.

Paul Carson stood brooding down upon them, sipping his coffee.

"Well, ladies, gentlemen, I take it we're ready to begin?" John West said impatiently. "We've all read these papers."

"Yes, yes," said Dr. Rothery, Dean of the Graduate School. "Paul, four of them lie within your department. Could you give us your views first?"

Paul stirred, set his cup down reluctantly. Seven pairs of eyes looked back from around the table, and he seated himself, touched the papers.

"Five of these are the sort of thing we've been seeing all our academic lives," he said. "The other six—"

The other six were different.

On the basis of these papers, these six students were the kind a professor remembered forever. Encyclopedic, brilliant, relentlessly rational, each took a solid position and argued his or her case with verve and fire. Here were young men and women who were bound to make a splash. A credit to the University.

"The other six are the products of computer-enhanced minds," he said. "Students so brilliant they verge on genius might well produce such papers; no others but computer-enhanced ones could. Not even brain pills could do this."

Professor West nodded. "So the pocket brain is an equalizer, as they say. Which would you rather teach, Paul, Lisa, Hank—brilliant students or dull ones?"

"What's to teach, if they can buy a program and simply *know* more than you've spent a lifetime learning?" Lisa Heiing said bitterly. "This paper on the musicology of the troubadours of the Renaissance—I found it difficult to judge. The student knows more than I do!"

Carol Stinnett stood to pour coffee. "But does your student know more about music in general than you do, Lisa? Or has he or she merely become an instant expert in a tiny field?"

"I don't know, but does it matter? I think he or she simply bought a bubble crammed with facts on ancient music of Europe or something like that, and marshalled all these facts about troubadors. With a pocket brain, it might be the work of an hour or so. John?"

Professor West declined to comment.

"What do you bet the student spent as little as five or six hours one week marshalling facts and writing the dissertation, then plugged into a printer?" Lisa shrugged expressively.

"And we're supposed to grant a degree for this?" Hank Allis said.

"According to the rules of the University—" John West began.

"We can't take refuge behind that one, John," said Rothery. "The purpose of this committee is to determine if the University rules should be changed, and if so, how. We went through all this with memory-enhancing pills."

"Very well." West thrust out his chin. "Then let's consider. A student who can turn out such a brilliant paper in two weeks might be uniquely well qualified to compete in the marketplace. Do you suppose that the School of Business will refuse this kind of paper? Or any engineering school? Incidentally, the Business School isn't

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represented on this committee. Why is that, Arthur?"

"Don't be more foolish than you have to be, John," said Professor Stinnett. She stirred her coffee. "It's because they would've approved without much thought. They're pragmatic and think only of the immediate future, not the distant future. And what's at stake here is education as we know it."

"Carol is blunt, but correct," Arthur Rothery said reluctantly. "I personally shudder at the thought of a society of mechanically educated hucksters with no sense of the great wellsprings of our culture—"

Professor West's mouth was twisted. "Nonsense! With all due respect, Arthur. Lisa, didn't you just tell us that some student of yours acquired enough knowledge of a highly restricted subject to challenge you, in your own field, within a week? If this kind of thing can be done in weeks, why should we require students to spend years studying? Why not give them all they need in bubble form—including all those great wellsprings which few of them actually do study?"

"But how long do they retain what they've learned?" Paul asked. "With brain pills, at least they learn, and remember. But with the brain, when they take it off, what do they have?"

"The subject retains something—quite a lot, if he frequently accesses a given field," said West defensively. "We mostly get our knowledge of our culture from the entertainment media anyway."

Rothery frowned.

"You have a point, John," said Hank Allis. "You too, Paul." He puffed his pipe. "As a university, our product is educated minds. Question: is an enhanced mind an educated one?—even if it can function at genius level with the help of the pocket brain. What if they lose their crutches?"

"What if they don't?" West countered. He looked challengingly at Allis, at Paul. "What if our society accepts computer-enhanced brains as normal? It's obvious that higher, yes and lower, education will undergo a massive alteration—a massive shakeout, rather. Only those institutions which adapt will survive. But I do not argue that. I argue only that education is our duty as well as our business. If we can produce minds functioning at genius level, how dare we demand that they fumble as morons?—In short, how will we meet this challenge to the traditional ways? I hope not with heads in sand."

"But is it education? The mere marshalling of facts—" Carol Stinnett stopped, shook her head.

Arthur Rothery looked at Paul. "Paul, what do you think?"

Paul frowned, troubled. There had been that point about the upgrading of the technology of Europe with the coming of the Romans that had amazed and delighted him. He hadn't seen till it was pointed out how much the old tribal ways tended to resist some technologies, and merely to profit from others by purchasing the products without learning the techniques. The Amerinds of North America had done the same—

He mentioned this briefly and added, "Still, the pocket brain is a crutch—" Like Carol, he ended by shaking his head.

Dr. Rothery tapped the table with a knuckle. "Ahem. We do have a recom-

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mendation. Namely, to accept all dissertations at face value, but to require the candidates to defend them in oral examinations without the aid of pocket brains. What do you think?"

"Just a moment."

They all looked at John West, some warily, some wearily.

"This is hardly a fair proceeding. Only one of us has used a pocket brain extensively, and only a couple of others have even tried them." He looked around at them. "I suggest that we all try using pocket brains for a week before we pass on their use."

"Pocket brains are expensive," Lisa Heiing said. "If you want to pay for this experiment—"

"*That won't be necessary.*" West pulled a denim sack with a "Brainfields" store label out of his briefcase. "I arranged to borrow seven from the campus computer shop. One for each of you." He passed them around.

In some alarm, Paul Carson picked up his. It was about the size of a small pocket watch but slimmer. A safety clip at the top held it in the pocket. Beside the safety clip was a snap at the end of the neuro-antenna, which was wound up inside. West handed out instruction books.

They had been given "Pocket Peaches," a sound brain, no longer state of the art but still very useful. Each probably retailed for a thousand dollars, but the prices were dropping and within a matter of months they'd probably go for seven-fifty. If they could be sold at all; more advanced brains were already out. The store wasn't taking much of a risk. If the pocket brain was accepted, students would be buying—probably already were buying—Pomegranates and Aardvark Cerebi.

They looked at each other. "It's a stunt," said Carol Stinnet.

"I don't care what you say, John," said Professor Bernard. "I will try it, but I'm not going to be convinced."

Paul felt the same, and he was no computer illit.

"*I don't say you will. But at least* you will have given it a fair trial."

"I think that we must at least do that," said Dr. Rothery reluctantly. "Despite our committment to traditional higher education, there is the specter of all those other schools accepting the brain while we have not."

Strolling across the campus deep in thought, Paul was startled by a voice at his shoulder.

"So, Paul! The intellectual departments are about to suffer the same dark night of the soul that the artistic departments did a few years ago!"

Paul paused on the paved path and looked around at Professor Morea. The smaller man skipped spryly up beside him, his long white hair flapping.

"Yes! Is it art, or is it not? We of the traditional school held that art is more than a mere matter of perception and expression—it is also, said we, a matter of skill. And if any fumblefingers with a computer program can turn out work as skillful as a master, what price Art?" Morea flourished his walking stick.

"Well, we lost that one. Isn't it wonderful that now the clumsy, and the lazy, and even the uncreative, can perpetrate their 'Art' upon us all! Ah, 'the Democratization of Art'! Well, perhaps

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it's for the best. Put me down for an old fogey."

He seized Paul's arm. "But tell me, Paul—do you hold with the 'Democratization of Education'? Is a young squirt with a computer in his pocket your equal in the History Department? If so, how'll you teach him? Who needs the University? Who needs *you?*"

But before Paul could answer, Morea gave his arm a pat, winked, flipped up his walking stick in mock salute, and skipped away.

A man of exaggerated views. They'd been through it all with the brain pill, and it hadn't destroyed the University.

Besides, Paul quite enjoyed making his own Christmas cards.

Mariam was interested when he reported it that night, but did not seem to understand how radical an advance the pocket brain was over the ultravolant computer that had only just displaced the micro.

"You've got an ultravolant yourself—isn't that what they call that little 'Flashfire'? You carry *it* in your pocket. How is this Peach Pit thing any different?"

"It is, though. On the basis of those dissertations. It actually enhances mental powers, or so they say."

"So do brain pills, but it turned out to be a big bugaboo. You still have to study or you won't remember, memory-enhancement or no."

"I know. I use them myself. But apparently the pocket brain *is* different."

"Well. You won't really know, though, till you try it out."

"Quite. I have a week. I thought I'd start tonight, after I finish with those papers and some administrative details."

"You can't use it for that?" she said, pointing her spoon at him.

"I don't want to learn to handle a new computer while I'm doing hard work."

"Then I won't be here to watch your Titanic struggles with the all-consuming Brain. I've got to go to Florence's—you remember, I told you about this thing—"

"Oh, yes. No matter, I may want solitude in any case."

He had had solitude for nearly an hour when the bell rang. It was a man in jeans and a denim jacket, with a box of tools and a broad smile.

"Sorry to be so late, Professor; should've been here an hour or two ago. To fix your fridge, remember?"

Paul did remember after a moment. "Oh yes, sorry; I'd forgotten." He escorted the fellow to the fridge, stood helplessly by for a while, brewed coffee. Whistling, the workman tore into the machine with the facility of long practice and total understanding of his task.

"You're the history prof, aren't you? Dr. Carson? You know anything about the Civil War?"

"A little; it was a hobby of mine when I had more time. But my professional field is Europe. I specialize in Roman Britain and Gaul, and have studied the Germanic tribes."

"Oh, yeah. I read your dissertation. Good stuff. But what I really like is the Civil War. That Grant, he was something! I've got it all here."

And he tapped, not his head, but his shirt pocket.

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Paul stood looking down, holding a coffee cup, face quite blank.

"Well, Prof, this baby's about had it, but I think if we can replace that relay, she'll go for another few years." He looked up. "You're going to have to go to thermoelectric before too long. But hang on till the price comes down. Two–three years."

He stood up. "Now, we got a problem. You maybe don't realize how old and obsolete these Model Bs are. We don't stock many parts for them, and certainly not that relay. They don't make 'em any more. But, there should be some in warehouses around the country. Let me call around."

He crossed to the phone, snapped a modem to it, and attached a lead from his pocket brain. It was, Paul observed, a Cerebus: typical snout and ears. The repairman stood with face tensed in concentration, eyes squinted but open, making no move to punch out numbers. Four minutes passed.

"Ah." He looked around, began disconnecting himself from the phone. "Found a boxful in a wholesaler's warehouse in Boulder. I put in an order for one, should be in town in two days. How about if I come back Thursday?"

"Certainly, certainly. And in the meantime?" Paul indicated the fridge.

"I jarred the old relay loose and oiled it; it should hold you that long. If it freezes up again—" he shrugged expressively. "Do without. Nothing anyone can do till the new relay comes in."

Afterward, Paul sat looking at his Pocket Peach for a long time.

It didn't come with the phone attachments that would enable him to access major mnemobubbles around the world. In fact, it was comparatively primitive, with but one bubble slot, already filled with an aspirin-sized bubble. Paul thumbed through the instruction booklet, realized that the real instructions were internal.

He pulled on the snap and a long thin line came out, looking like a nylon monofilament. He looped this around his neck and snapped the clip over the line. This was the neuro-antenna. It hung in a loose loop around his neck, and he dropped the brain into his inside jacket pocket, not bothering with the security clip.

He felt no different.

Be patient, the booklet had said. But he had used neuro-antennae before. They had replaced headphones—and hearing aides. His brain had been trained to interpret signal input through nerve induction.

Presently he was hearing a faint tune, so faint it was merely a nagging tune "in his head." Then it swelled until he was hearing it flawlessly. A simple jingle, which he had heard often enough: the Peach Patch theme music, played low. But he had never appreciated it so much as now. Paul had "no ear for music": a defect of the short-term memory, among other things, that not even brain pills had helped.

—Paul was thinking about peaches. He visualized one, and realized that his brain was interpreting the visual signal it was getting from the pocket brain. Since much of the human brain is devoted to analyzing visual signals, this was easy.

These signals, of course, were coming in from an unusual source—the major nerve trunk in his neck. Signals

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could be transmitted even from an arm or a leg. But if major two-way communication was involved, it tended to overload those nerves, paralyzing the limb during "communion." Hence the necessity to "insert" close to the brain and over major nerve trunks.

The peach was now quite clear in his mind and he began to read, eyes open. Rapidly, more rapidly; it was more than reading now, he was absorbing information at the speed of thought. Not so strange; thoughts go faster than reading. Soon it was as if he had ceased to read at all, but simply *remembered* what the Pocket Peach told him.

"Communing," indeed.

The brain started to run through its embubbled menu, but he cut that short. Within fifteen minutes he had mastered the basics of operation. It was simply a matter of teaching the pocket brain his own internal cues for calling up memories and recording them. Other things operated on the same demand principle: when he had been practicing for a quarter of an hour, he wondered idly what the time was and immediately knew.

The date, too, he discovered; the Peach had a chrono-calendric circuit. He knew the time of day at Barcelona, and Sydney, and Tokyo. He found that the "major" circuit could be altered by a simple act of the will: "I'm in Barcelona" followed by "What time is it?" would give him Barcelona time until he altered it again.

Having requested the time for all the planets and moons for which he knew any place names—they all had calendars!—Paul was amusing himself by running through the stages of the tides around the world when the phone chimed. He looked at his wrist, smiled as he "knew" the answer, reflecting that no doubt he'd soon lose that habit.

"Professor Carson? Paul?" Dean Rothery.

"Yes, Arthur? Is something wrong?" The dean sounded perturbed.

"I don't—I mean, I've been told —there's a riot—uh—"

"Oh God. What is it this time?" Not Puerto Rico again, he hoped.

"Uh—Professor West and Professor Stinnett have both called me. She said —Professor Stinnett—that you'd be the best man to talk to them—"

"About what? And why me?"

"About the—uh—pocket brain. Uh—the students—they're at the student union—they're demonstrating about the pocket brain—"

It was not a riot. The mob was not even unruly. Paul fumed a little at the administration's touchiness. This was the Midwest, for crissakes; even Puerto Rico hadn't touched off any actual violence. Rothery was an old woman afraid of mice.

He drove by, had to seek parking farther away.

Hmmm. Those weren't all students. Quite a number of older people there. Paul parked, approached. The student union had a high entry and the platform was thronged with people yelling down at a yelling crowd. Not everyone here was interested; some were students pushing past into or out of the union.

But there were easily a hundred students and half as many older people here who were interested. With a slight start Paul recognized Professor Morea of the

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Arts Department sitting sardonically on the broad concrete balustrade that ringed the platform. He seemed to be taking no part. Professors Stinnett and West were nowhere to be seen.

Heads started to turn, his name was called—"Professor Carson!" "Hey, it's Prof Carson!"—and the speakers above looked toward him eagerly. "Professor Carson, come on up!"

Well, there was no other representative of Authority here, if one discounted Professor Morea, who had clearly taken himself out of the action. And they had a message they wanted to put across.

"Hey, Professor, we hear you're going to ban pocket power!"

"You're on the committee, right, Prof? You gonna ban the brains?"

This was so impromptu a demonstration they didn't even have bullhorns. He shook hands with a couple of students he recognized, concealed a twinge of dismay when he saw Rick Ahearn on the platform—president of the student body, usually too cool and too shrewd to get mixed up in this kind of confrontational politics.

For a few seconds they raved around the steps, waving fists in the air, yelling at him too from atop the platform. Paul stood unsmiling, one hand up, palm forward: *I am here, I see you, hear you.* Then they fell silent and he had a sudden pang of pleasure so great it almost brought tears to his eyes.

They respected him.

So this was why men sold their souls to become presidents of countries and colleges.

"Professor," one of the grad students began formally, "we are here to present a petition to the Administration—" but then his formality broke. "We don't have it composed yet, sir, but—"

The crowd cut him off: "The pocket brain!" "Pocket power!" "We want pocket brains!" "Pocket brains, *si!* Mind slavery, no!"

"You are on the committee, sir—"

"Yes." Paul turned back to them, raised his hand again. They fell silent, and with a touch of melodrama he pulled out his Pocket Peach and showed it to them. —Fortunately his unaided brain fished up the grad student's name; that was not yet in the Peach's mnemobubble.

"Yes, I am on the committee that will determine if the pocket brain will be permitted on the University, as Ms. Stadtler has said. As you see, I am giving the pocket brain a try. All of us on the committee are wearing these Peaches. My acquaintanceship with the brain is too slight for me to draw important conclusions as yet; but be assured that I will give every consideration—"

"Consideration, hell!" came a shout from below.

Good thing he wasn't running for president.

An old woman climbed the steps, dragging a diffident young man behind her. When she got closer he saw that she was not so old as she seemed, middle-aged at most. There was a neuroantenna around her neck and around that of the lad. She was dressed like a working woman in cheap modest finery, her Sunday clothes. The boy had to be an undergraduate, still very young. He looked as if he wished he were elsewhere.

"You say consideration!" she cried. "I say—no, I don't say that, you think I say too strong, but you know what I

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mean! You talk and talk and what it git us? I—listen!''

''Yes, madam?''

She looked at him, he looked courteously back, leaning a little toward her, and some of the wildness went out of her eyes. Now she stopped, took a deep breath, and calmed down.

''You're *listen'n*,'' she said wonderingly.

''Of course.''

She gulped, took another breath, spoke more reasonably. ''Listen, my Georgie here, he didn't have no—didn't have much of a chance 'cause—because I couldn't give him one.'' She paused again and spoke more slowly still. ''I spent *ten years* in your fuckin' schools, Mister—Professor, and I couldn't help Georgie get him a—get a good start. Because I didn't know how. *I didn't know how to read!* Georgie tried to teach me, didn't you Georgie, but I didn't have the time, and besides, it was all so hard and so complicated, as when I was in school, I didn't really try. I just said, 'Georgie, honey, you go ahead and learn everything there is, and I'll scrub floors to help you.' That's what I did, Professor Carson, I scrubbed floors to help, because that's all the help I *could* be!''

''And it wasn't enough, Professor,'' said the boy firmly. He was still nervous, but he faced Paul deliberately. ''I didn't get that early foundation and I could never make it up. I was flunking out, Professor. Only the brain keeps me here—without it, I'll spend *my* life scrubbing floors.''

''No you won't, Georgie! This dumb university may not know a good thing, but the Air Force does, and so do lots of other employers. Professor, he's as good with that brain as anybody that's been educated is without it. Professor, that ain't all! *I can read!*''

''With your pocket brain.''

''Yes, sir, it's only an old Medulla, I got it second hand, but first thing I did was learn how to read!'' Tears streamed down her face. ''Professor, lots of people can't remember when they couldn't read. *They don't know!* Every day I get up, I say, *I can read! I can read! I can read!* First thing I do every morning, I go out and read the street signs, I can find my way around now, and I buy me a newspaper and I read the want ads. I got me a better job, Professor, and I got my sister a better job, and—''

She paused to wipe her face; George nodded solemnly.

''And we ain't lookin' back!'' She whirled to face the crowd, holding her obsolescent brain high. ''This is the sign of freedom, brothers and sisters! This is the sign of equality! This is the sign of *equity!*''

And the students cheered.

It was quite late when he got back, but Mariam was not in. On the phone her voice was guilty, yet amused. ''Didn't know you'd gone out, Professor Darling. Naughty, naughty. I'm going to be doing it too, though, so I can't say much. You remember Phyllis White? I introduced you at—oh, never mind! We haven't seen each other in ages, and her husband is out of town, and I'm dying for a night out—and I'm running out of breath, so I'll see you when I get in—or when *you* get in!''

Pity she wasn't in. There was coffee hot. He poured some, sipped. Restlessly he paced about with his cup, thinking of Georgie and his amazing mother.

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You couldn't help but be warmed for all the illiterates out there. What was it the package on the Peach's word processor said? Proper spelling and grammar assured? He'd always been regarded as a curmudgeon because of his insistence on grammar and diction. Imagine a new age of *proper* speech and writing!

Absently he peered out the window, let the curtain drop, tapped the plaque they'd bought in Hong Kong. How long was she going to be out, anyhow?

But what if she lost all the "assured spelling and grammar" when she took it off? And what if she didn't?

It seemed logical to him, as some had said it happened, that knowledge residing in the pocket brain would gradually be overlaid onto the organic brain using it. But in how systematic a manner?

He tapped the plaque again, frowning. But it no longer troubled him that the four Chinese characters were side by side rather than vertical.

They were fán rǒng fāng xiòng, and in this usage horizontal was right. Of course they didn't mean "Bless this House" or "Fortune's Favor" as they'd explained to many guests.

Yet they did.

Paul frowned. The general thrust was "Prosperity," but this was a complex statement.—

Coffee splashed on his ankle but the cup did not break. Paul bent over slowly to pick it up, and, still bent, peered upward. Yes. He could read it. He could even hear the Chinese words, properly pronounced and in the proper tones, ghostly in his head. To speak proper Chinese he had merely to think the thought in English and echo the odd sounds welling up from the pocket brain. Yes, there it was in the menu: *Introductory Mandarin.*

Paul sighed, straightened with the cup.

How long would it take to learn a whole language?

Who *cared,* if you didn't have to learn? If you already knew? And using the pocket brain got easier and easier as you did it. Even for a two-week trip it might be—

The bell rang. Opening the door, he said, "*Ní hǎ ma?*"

Professor Morea was startled. "What?"

"*Ní hú ma?* How are you? Hello, in other words. Varies with dialect."

Morea closed his mouth. "In what language?"

"Chinese. Come in, Professor. I saw you at the demonstration. Your attitude was somewhat, er, neutral, I thought."

The older man peered at him. "So you're still wearing that confounded thing. Thought you'd have taken it off when you got home. Your wife? Mariam, isn't it?"

"Out on the town. You've come to remonstrate with me, then."

Morea glared at him, leaned his stick against the couch. "Of course. Think I'm a lover of the brain? That your horn? Mind?"

"Not at all."

Morea crossed to the stereo horn, raised his eyebrows in respect at the selections in the bubble menu, pushed buttons. Music issued from around them. Mellow silver tones. Paul had heard that piece many times before; it was one of his favorites. The silvery tones, those he could remember. The arrangement of notes, no, those escaped him after each time he heard the piece.

"That old woman. Made quite ar

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impression on you."

"Yes, she did." Paul poured coffee. "Cream, sugar?"

"Cream, thank you. Really need a little rum, but doctor's orders. Me, too, Paul. A big impression. But not the one you got, I think."

"No?"

"No." Morea sipped scalding coffee. "Magnificent! Beautiful! That this old woman could go out and buy an education, just like that! An education the tottering, corrupt old system we represent failed to give her. But, Paul, that system has virtues the pocket brain can't match. The community of committed scholars who create the knowledge that ultimately finds its way into those bubbles they buy so cheaply. The ivy-covered ivory tower, the cool quiet refuge from the roaring heart of our society, the oasis in the cultural desert."

"This will be swept away—?" But Paul thought he saw where the old man's argument was leading.

Morea nodded. "Swept away. Quite so. Why do these scholarly enclaves exist, after all, but to teach? And if that function is superseded by boughten knowledge—? Paul, that woman probably bought a college education for *a hundred and fifty dollars* . . . second hand."

Sonata in G for Flute and Harpsichord, by Bach . . . Paul was slow to recognize it even granted his tin ear. But he was concentrating on other things.

"*One percent—*" Paul cleared his throat. "One percent of the cost of four years here?"

"Roughly that, yes. And what do they get? A bagful of facts. Granted, not many of our conventional students ever exited with much more. But they'd been given a glimpse of the possibility of becoming more than a performing ape. And those who had the real capacity almost always found their way to us."

"I can't say that I see myself as the doddering guardian of a dying flame, Professor Morea."

"But that's just what you are, unless you sell out and go commercial," Morea said grimly. He crossed to the stereo horn and punched a button viciously. The horn hesitated, slid down to the next selection. To Paul it was a confused medley of orchestral sounds, quite unidentifiable—yet it sounded familiar. It was his bubble, after all.

"The counter argument, Professor," he said soberly, "is that for the first time in history we may have an educated—a *literate*—public. The consequences will be incalculable. Nor do I believe, as do so many of you, that art and other cultural activities are forever above the masses. My mother used to embroider and crochet some of the most beautiful art pieces I have ever seen. That the art form was useful, and therefore a craft, did not detract from its beauty."

Morea's mouth twisted. He set the cup down in a marked fashion. "So you've made up your mind?"

"Not at all! I merely suggest that there are two sides to this argument, as with so many others."

"Paul, your voice carries maybe more weight than you think. I don't think you turned up at that demonstration by accident. I don't think you appeared on the committee by accident. They all look to you, even that paranoid Rothery—"

Partly in avoidance of this uncom-

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fortable praise, and partly because of a lifelong irritation, Paul's attention turned to the music. He was about ready to go and look at the glowing letters.

"I have a mental image of a whole society of mental cripples hobbling around on crutches," Morea was continuing, unaware that he had lost his audience.

But the moment Paul's attention was turned consciously to it, he *knew*, in the way that he knew the time and the tide. For the pocket brain had all this time been recording the music as heard through his ears, and there were no defects in its short-term memory. In a mere moment—it was ultravolant—the Pocket Peach had searched through its store of music and made a match.

"*Musikalisches Opfer*," he said involuntarily. "The 'Musical Offering.' Bach again."

"Why, yes." Professor Morea dismissed Bach with a wave. "I was saying—"

Paul stared at him. "You don't understand, Professor. "I *recognized* it!" He had an abrupt understanding of how Georgie's mother had felt. *I can read! I can read!* "Morea, I can follow the music!"

"Eh?"

"I can follow the music! My God, I was never able to follow—oh, my God! Music!"

Music indeed: Professor Morea had cut directly to the six-part fugue, and to Paul's unbelieving ear, worlds were opening. For the first time he *comprehended* the beauty of music, witty and inventive as words arrayed as poetry of Shakespearean height. Six voices, each singing the Royal Theme, entering like the voices in a canon but with vastly greater complexity, delayed, backwards, inverted, all playing off each other with a rich harmonic accompaniment . . . words could not express the almost visual complexity that burst upon Paul all at once. It wanted a shout, a cry, a song.

He felt like Miranda, crying, "Oh brave new world, that has such people in't!" at a moment of delighted surprise; like Balboa gazing at the Pacific in wild surmise, or Tombaugh at Pluto, silent, in the wintry skies.

"What? Morea, you can't understand! You can't possibly—" His cheeks were wet with tears. "Even Chinese can't compare—"

Society of cripples? For the first time in his life Paul felt himself to be a whole man.

When the fugue had played itself out, Paul made an effort and turned off the horn. It was a wrench, but he could listen at his leisure later.

"I know what you're going to say, Professor Morea. This is something I cannot retain when I take off the brain. But I don't care! With the brain—"

Morea nodded sadly. "So a new age now begins. What will it be like? What will replace the university? Will anything?"

"I don't know. Maybe—" Paul looked at his Pocket Peach with dazed wonder. "Maybe we'll take a step closer to godhood."

"Is mankind ready for godhood? I think not!"

"I agree with that. But, Professor . . . maybe some of us need help, just to be fully human." I can read, he thought. I can read! I can read! ■

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Jay Kay Klein's biolog

Duncan Alasdair Lunan is the only *Analog* author I know who is entitled to wear regimental dress kilts, without insignia, since his father was a captain in the Seaforth Highlanders during WWII. Born in Edinburgh, Duncan was raised in Treen, Ayrshire, and lived in Wishaw, Lanarkshire before moving to Glasgow. Attending Glasgow University, he received an M.A. with honors in English and Philosophy. Unusually for a British humanities student, but perhaps not for a Scot, he took courses in physics and astronomy, plus a year of business studies along with a postgraduate diploma in education.

He is now a full-time writer, but even in Scotland a would-be writer can run through an assortment of unexpected jobs: park ranger, driver, researcher, librarian, management trainee in the fisheries division of a large company, and penultimately head of an astronomy project sponsored by the Glasgow Parks Department. This last resulted in the first astronomical megalith built in Britain for 3000 years!

A turn toward professional SF writing came after meeting John Campbell during Duncan's first SF convention, the 1965 Worldcon in London. A vociferous Scotophile, Campbell's attention was attracted by Duncan's kilt and ve-r-r-ry str-r-r-ong burr. His first *Analog* story appeared in January, 1973, and exhibited Duncan's interest in folk music, knowledge of astronomy, and Scots background. He thinks there's a very distinctive tone to SF done by Scottish writers. There is a stress on scientific and technical subjects in their educational tradition, coupled with a distinctive Celtic vision and sense of wonder.

A first SF influence on Duncan came through a Scottish writer's SF series for children on BBC, followed by a child's book by Arthur C. Clarke given for his eighth birthday present. His early ambition was to be an astronaut, but mathematics intervened between him and a science degree. Another disappointment came when he discovered there were no jobs for Arts graduates. It should be noted, too, that one of the first things to be cut by Mrs. Thatcher's new government was the parks' astronomy project. Since 1965 he's been an officer of the Association in Scotland of Research into Astronautics, out of which came Duncan's three non-fiction books: *Interstellar Contact*, *New Worlds for Old*, and *Man and the Planets*.

The cliché question asked of SF writers is "where do you get your (crazy) ideas?" In Duncan's case, they literally come from all over, usually sparked by some unrelated incident such as watching Leonard Bernstein conduct *The Rite of Spring*. Even from dreams! Unless he starts with a title, this is the last thing to come to him and is a sign from his unconscious that the story has come together. One thing that runs through all his stories is the necessity of forestalling all threats to the survival of the human race. ■

Duncan Lunan

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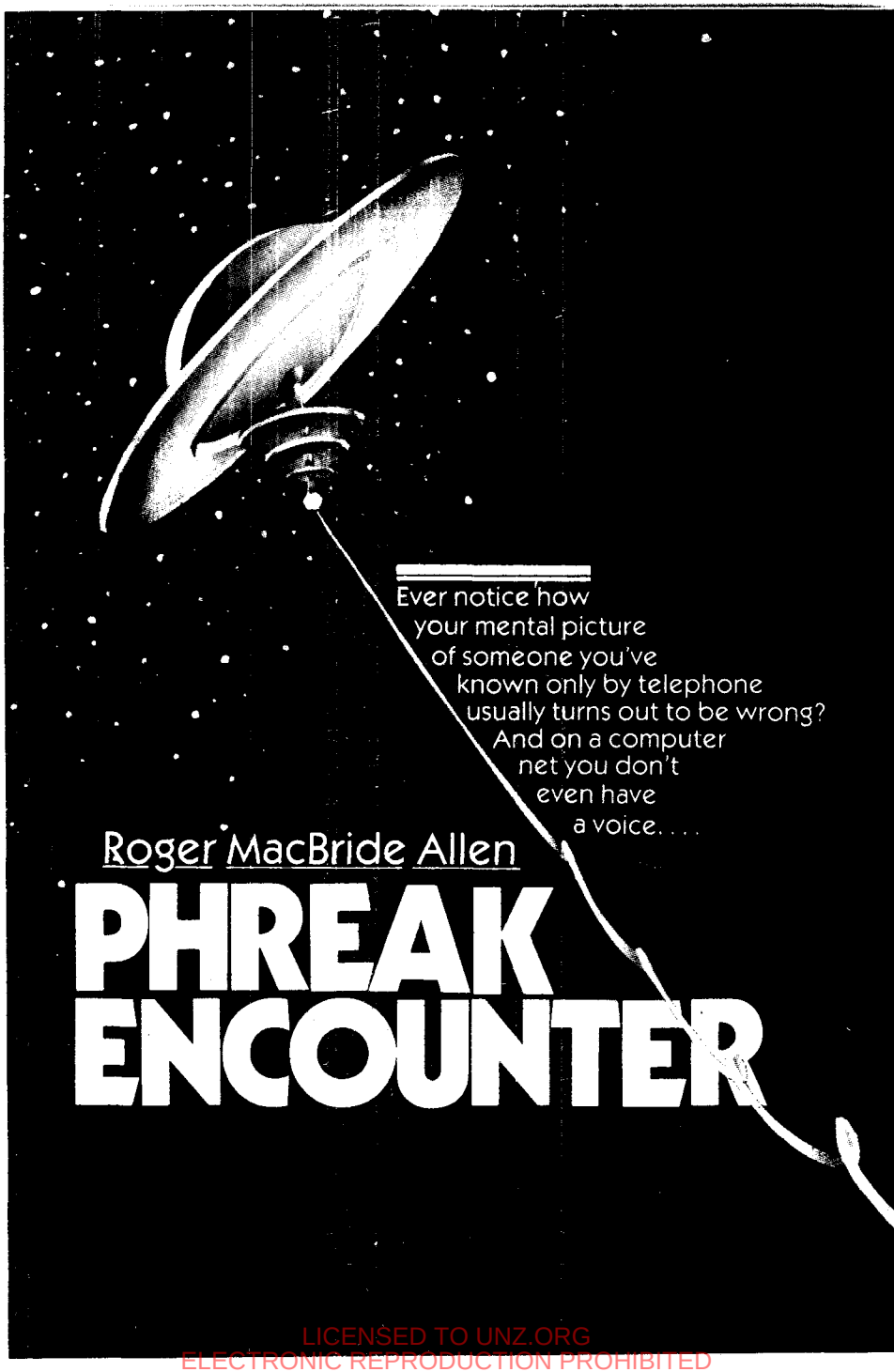

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Barringer had always been bothered by phones. Not just because people called as he stepped into the shower, or because he sometimes got trapped on hold and was forced to listen to Muzak, or because wrong numbers always waited until he was asleep. It was more than that.

He was bothered by the whole *idea* of telephones, by the way they made people act, by the elaborate and unwritten rules of behavior and even language that had evolved to accommodate a collection of wires and plastic.

He was thrown when he was told someone was "at" a certain number, as if they actually lived, or at least existed, at some locus inside a switching center, some point inside a computer defined by an area code, an exchange prefix, and a four-digit number.

None of this would have mattered so much if Cliff Barringer had worked for someone beside the phone company. On the other hand, if Barringer had worked for someone else, or had even worked for another department of C&P Telephone, he probably wouldn't have given so much thought to the Meaning of Phones. He capitalized it that way in his head, the way some people capitalized the Meaning of Life.

But even working for the phone company wouldn't have mattered so much, so long as someone at the bank had had better handwriting.

A year before, Barringer had gotten a car loan. Since he had signed for the loan on the fourth of the month, on the fourth of each month thereafter he was expected to pay up. But some unknown person had scribbled down the "4" so it looked like a "1," a much more common date for a loan payment. That mistake had been taken root somehow, become enshrined in some file, and now, promptly at 10:00 on the third of each month, a Mr. Phillip Ramsey called Barringer from the bank to tell him that his car payment was forty-eight hours overdue.

After a year of Ramsey's calls, Barringer had gotten used to them. They were part of the scheme of things. Just as the sun coming up proved it was a new day, or seeing a new episode of Masterpiece Theater proved it was Sunday night, Ramsey's call was a sure sign that March, or June, or September, or whatever month it was, had indeed begun.

The call was just the start of the beginning-of-the-month ritual. Barringer worked out of a Bethesda office, but his job took him all over the Washington area and had him on the road practically every day. He was out of the office almost every time Ramsey called, and so each month Barringer had to call Ramsey back in late afternoon and straighten the whole thing out again. Ramsey would put Barringer on hold and force him to listen to Muzak while he checked some other file. Then Ramsey would recall going through it all the month before, apologize, and forget all about it until the next month when it came time to harrass Barringer again. There was something perfect in the machine-like regularity of it all.

So it went from month to month until the late afternoon of the third of October, 1986, when Barringer got the message that Ramsey had called that morning. He returned the call, and got a perfectly routine recorded announce-

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ment saying that the number had been disconnected.

Barringer had an overactive imagination, he tended to worry too much, and it was the end of a hard day. And so that recording gave him chills down his spine. Barringer had always had the idea that Ramsey *was* his phone number, that the man and the number were one and the same, a combined thing. Ramsey answered the phone that way each month when Barringer called back: "Phillip Ramsey 844-1754." The name didn't sound complete without the number. Maybe, Barringer thought, it was Ramsey *himself* who had been "disconnected," that had ceased to exist. Barringer had never actually *seen* Ramsey, anyway. To Barringer, his loan officer was but a slightly nasal voice that was compelled to call him each month on a fool's errand, a voice that did its appointed task with the same demented relentlessness of any automatic machine left to its own devices.

In earlier times, disembodied voices had come with messages from God. Today they demanded that $213.15 be remitted promptly.

There were certainly enough people out there who would delight in the idea that their loan officer had vanished in the hopes that records had vanished along with the man, but Cliff Barringer was a good guy. Also to the point, his work for C&P Telephone left him wide open to the idea that people and phones could do very strange things to each other. He worried. Besides, Ramsey had never actually been cruel or unfair, just incompetent. Barringer bore Ramsey no ill will, had no desire to see him disconnected. Besides, if it could happen to Ramsey, it could happen to anyone. Barringer himself might be next. It was enlightened self-interest to see what was up. The bank wasn't far away and it never hurt to check.

The long and the short of it was that Barringer rushed over to the bank, arrived just before closing, blundered his way past the best defense three layers of receptionists could put up, and found himself in the Loan Department, up against the last of the receptionists, a friendly-looking woman named Miss McGillicutty.

McGillicutty listened to Barringer ask for Mr. Ramsey and gave him a long hard look. The Loan Department attracted its share of kooks, and it was McGillicutty's job to decide who were the dangerous ones, the types who would threaten to blow the place up because the bank wanted its money back. This guy looked pretty much okay. Bushy brown beard, and hair still there but thinning on top. Clever, capable, strong-looking hands that had done some manual labor, although not recently. Medium height, a little pudgy. Dressed in fairly new work clothes, with a shirt pocket full of pens and a phone company photo ID hung on a chain around his neck. Round, soft face, and eyes that looked not crazed or threatening, or panicked, but concerned. The eyes decided her. This guy didn't want to hurt anyone. "Mr. Ramsey is busy, Mr., ah, Barringer, but if you could wait, perhaps he could talk to you in a few minutes."

"Thanks, but I don't need to talk to him. I just want to see him, make sure he's all right." Barringer said. Now that he was here, in a real-looking office,

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talking to a real person, the idea that a man could disappear because of a phone number seemed a little less likely, though still not impossible. On the other hand, maybe it would be best if he didn't try to explain his worries. "Is he all right?"

"I see," McGillicutty said, although she didn't. "I can promise you Mr. Ramsey is fine. There is he, across the office, third desk from the wall."

"That's him? The thin guy in the gray suit, sort of pale?"

That could be practically anyone around here, McGillicutty thought. "That's him, fit as a fiddle. Why did you think he might not be all right?"

"That's really *him?*" Somehow the bland looking man across the room still didn't look faceless enough, robotic enough, to match the nasal, monotonous nagging he had endured over the last year. "You're sure that's Phillip Ramsey 844-1754?"

"That *is* Mr. Ramsey," she said carefully, "right over there, but that's not his phone number anymore. They had to disconnect it this morning because of all the wrong numbers. Mr. Ramsey's phone was the worst, so they unplugged him altogether and he doesn't have a new phone yet. I see from your ID you're with the phone company. Are you here to work on the problem?"

"What? Oh, no, I'm here for myself, not on business. But it was just wrong numbers?" he asked, feeling both relieved and foolish. "That's all?"

"Not exactly all—" she was interrupted by the phone ringing. "Excuse me." She picked up the handset to talk. "Loan Depart—oh, damn. Here, Mr. Barringer, listen for yourself."

With a certain trepidation, Cliff Barringer took the handset and put it to his ear. There was a high pitched *beeeeeEEEP, beeeeeEEEP* that went on and on. "Ah. I see," he said, breathing a sigh of relief. This was suddenly familiar turf. This was what he spent his working days on. He hung up the phone and spoke. "That's a carrier signal from some computer out there. Somebody is trying to contact a computer over phone lines, and hook his own computer up to it. He's programmed his computer to do its own dialing, and then told it to call a wrong number. So it gets you."

"But then we get other calls. As soon as anyone answers, the person calling just says 'sorry' and hangs up, or else doesn't say anything at all and hangs up."

"That'd be people with less fancy computers who are misdialing manually. They're expecting to get a tone like the one you're getting. If they get it, they throw a switch and the signal goes into the computer. When they hear a person, they know it must be a wrong number and drop the handset."

"That almost makes sense."

"Mmmph. Listen, let me do a little work on this tonight. Just on my own. I can probably get to the computer they're all calling and leave a message on it for people to dial more carefully."

"I wouldn't want you to—"

"Oh, no, it's no trouble. Fooling with phones and computers is my hobby."

"What do you do for the phone company?"

"I fool with phones and computers."

"At least you must enjoy your work."

"Yeah, I suppose. Dr. Frankenstein

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probably enjoyed working on the Monster at first, too."

"That's a bit extreme, isn't it?"

"Maybe. But my job put me in touch with things that scare me. I track down computer-and-phone systems that are out of control, illegal. Computer hackers and phone phreaks. There are some very weird people out there. I've seen what they can do. I worry what they're going to do next."

Jean McGillicutty took a long look at Barringer. She was starting to revise her opinion. Oh, Barringer was kind of weird, all right. But past that, he seemed pleasant—more than pleasant, kindly. And he looked harmless. She thought he looked like he might even be worth talking to. In her world, that simply meant he didn't look like a banker. But he was probably a shy type. She would have to do the pushing. "Hold it. It's quitting time, and McDonald's Raw Bar is just down the block. They sell draught beer cheap, it's been a rough day, I was planning on having one, and I hate drinking alone. Let me be real forward and offer to buy you one."

Barringer blushed and then grinned. "Daddy raised me never to turn down free beer."

"Oh, it's not free. In return, you have to explain what the hell you're talking about."

"Sold."

Fifteen minutes later they were perched on a pair of tired old bar stools in a dark, almost murky tavern that looked like it had nearly been torn down a dozen times. It was one of the few surviving single-story buildings in that part of Bethesda, surrounded all sides by new construction and new roads. All good bars have always looked like they belonged to a previous age, and the Raw Bar was no expectation.

A mug of beer in one hand and the bowl of peanuts close by the other, McGillicutty was ready to listen. A comfortably ramshackle bar beat a banker's office all hollow for conversation. "Okay, hackers I've heard of, but what's a freak?"

"It's spelled a little oddly, p-h-r-e-a-k, so it'll start the same way 'phone' does. People usually draw the 'f' sound out a little to make the distinction."

"Spell it as you will, but what's a phreak?"

"Ever hear of Captain Crunch?"

"Kid's cereal, right?"

"Well, that's where he got the name. Captain Crunch was one of the first phone phreaks, from maybe fifteen years ago. And he was one of the best. He got his name from a toy that came in boxes of the cereal. A toy whistle that just happened to have exactly the right tone so that if you held it up to the phone and blew into it, you could cut in some parts of Ma Bell that civilians weren't supposed to be able to reach. The whistle let anyone enter tone commands. That's the sort of thing a phone phreak does. He likes to play games with the telco—"

"Telco?"

"Telephone company. Phreaks learn access codes, find ways to bill long distance calls to, say, a number at the Pentagon. Mostly it's kids fooling around. Supposedly one guy used one public phone to call the next phone booth over—except he routed the call through 50 states and something like four com-

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munications satellites. And that was maybe twelve years ago, long before the first of the personal computers hit the market. You can imagine what a phone phreak can do with a computer if he can pull those kinds of tricks *without* one. They get sneakier all the time. My job is to keep a step or two ahead of them."

"What happens when you get behind?"

Barringer grinned. "Never happens, at least not for long. I know some stuff, I've got some people. You know the old saying, set a thief to catch a thief?"

"You mean you're an ex-phreak who's gone straight?"

"Oh, no, no. I'm allergic to clichés. What I meant was, I'm a part-timer on the phone police phorce. About half the time I'm a trouble shooter, solving problems when people are having legit phone and computer systems installed. That's where I learned enough to be a phone cop. In fact, six months ago I was sworn in as a Montgomery County deputy sheriff. C&P Telephone and Atlantic Bell were involved in so many busts against people doing computer crime that the county decided it was less paper work if a few of us had some police powers. I figure if the regular cops can have stool pigeons, so can the phone cops. I've got files on twenty or thirty basically harmless kids who have pulled stunts they shouldn't have. If I nab kids like that and turn them over to the real cops, all I've done is give 'em an arrest sheet. That makes it tough for them later on, maybe keeps them out of a job, makes them mad, makes them want to get even with the big bad phone company. Instead, I give them a good scare. Then when it looks like they are in deep, I tell them I won't pull 'em in. I leave 'em alone and tell them to keep fooling around but not to go overboard. In return they get to play spy and let me know if any really bad stuff is happening."

"You don't look like a cop."

"None of the good ones do. So give me the facts, ma'am. Just the facts. Give me the other numbers in your office that got a lot of these calls. And lemme buy the next round."

When Barringer got to work on tracking down the computer in question, some of his original paranoia came back to him. Things were a little strange. But that might have been the hour. What with getting home and making dinner and playing with the cats and so forth, it was midnight before he even got started. On the other hand, late night was the traditional time for hackers to come out and play.

Finding the computer everyone was trying to call was easy. There were four or five basic kinds of mistakes people made when dialing phone numbers—transposing certain pairs of digits, reading a "6" for a "9" or vice versa, a finger slipping from one touchtone button to another—and with a list of the numbers people actually got when they made mistakes, it was easy for Barringer to back into the number they had been trying for. In five minutes he had a list of the most likely numbers.

Barringer had a few computers around the house, and he powered up a clunky, ugly, lovable old Kaypro for the job at hand. He brought up his telecommunications program, made sure the printer was ready to get down a hard copy of

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everything that happened, for later reference, and started trying numbers. Maybe he had been fighting hackers too long—it didn't even occur to him that the guy he reached on the first try wouldn't be too wild over getting a call and being hung up on at that hour. Barringer simply poked his finger down on the hang-up switch when he heard a "hello" instead of a beep. But then, Barringer had always felt that strangers on the phone weren't real people. On the second try, he raised a carrier tone. He pushed some buttons and piped the signal to the Kaypro.

He had been expecting to find a business computer system, or a financial database service, something that would attract a lot of daytime calls. Instead, a sign-on message that said

FRIENDLY NEIGHBORS ELECTRONIC
BULLETIN BOARD SERVICE

popped up on his screen, and that was decidedly strange. A Bulletin Board Service, a BBS, was usually pretty quiet during the day. BBSs were places where computer hobbyists fooled around, leaving each other messages, praising or insulting a piece of software, passing around gossip, jokes, and computer files. It was nighttime stuff: Most hobbyists had daytime jobs and couldn't make calls to the board during business hours.

Barringer had a personal rule of thumb—for every hundred correctly dialed numbers, there was one wrongo. For the number of wrongos that had been bugging Ramsey and his coworkers, there had to be an enormous number of calls made to this number, way too many for the average BBS from 9:00 to 5:00. This was one popular board.

WHAT IS YOUR FIRST AND LAST NAME?

the computer on the other end of the phone asked.

Barringer typed in *William Heller*, one of the many real-sounding fake names he used in his work.

ARE YOU A FIRST TIME USER?

Yes

PLEASE ENTER A PASSWORD. YOU WILL NEED TO ENTER THIS PASSWORD TO GET ACCESS TO FRIENDLY NEIGHBORS, SO PLEASE REMEMBER IT.

Barringer smiled to himself and typed in RAMSEY. After all, Ramsey had started this.

YOUR FRIENDLY NEIGHBORS BID YOU WELCOME. FOLLOWING IS A LIST OF SERVICES AND PROGRAMS AVAILABLE ON THIS BOARD. THE RULES OF THIS BOARD ARE SIMPLE. FOR EVERY USE OF A FRIENDLY NEIGHBORS SERVICE, YOU MUST FIRST TELL US A NEW AND INTERESTING FACT. ONE SERVICE, ONE FACT. WE HAVE PLENTY OF PHONE LINES—NO TIME LIMIT ON USE. ENJOY!!!

THE FRIENDLY SYSOP

It was a "menu-driven" system, where you were presented with a numbered list of things to do, each only a general description. You entered the number of your choice, and a submenu came up, with a more detailed list of possibilities. You choose from one of those, and a sub-sub-menu came up, each item on it a detailed description of more goodies. Only at the fourth level did you get down to work. Menus were a good way to run a system with a lot of things on it, and there sure was a lot here. A hell of a lot.

Barringer decided the system operator, the sysop, was one real nice guy.

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The options offered on the menus made his mouth water. If ten percent of it was true, this was the happy hunting ground for every hacker and hobbyist, every wirehead and computer nerd and phone phreak in the world.

There were working programs and games for every computer he had ever heard of, some of them legal public domain stuff, but a lot of obviously bootlegs of copyrighted progs. There were patch lines into practically every college and university computer system in the country. There was a service that allowed a user to call any phone-equipped computer anywhere in the world without charge by calling up the Friendly Neighbors board and letting it route the call. There was a search program patched into a database with a nationwide phone directory, including long distance numbers and unlisted numbers. You could look up numbers by name, or name by number, or either by address. You could get the zip code or local equivalent for any place in the world. The *Encyclopaedia Brittanica* and *Americana* were available, not just abstracts but the whole shooting works, there on-line to browse through, along with *LaRousse* and the *Great Soviet Encyclopedia* and a dozen Barringer had never heard of.

There was a complete legal services library search service, and a patch into the MEDFAX medical research database. The A.P., U.P.I., Reuteurs, Agence Francé, Pravda, P.A.P., the Dow-Jones News service—every wire and news service in the world was there. The electronic card catalog of the Library of Congress was online.

And that just scratched the surface. It took a half-hour for Barringer to get through the various menus. All free. Just give the Friendly Neighbors Sysop an interesting fact.

CARE TO GIVE US A TRY?

Barringer had to see if it was for real. The temptation was too great.

Yes

THEN TELL ME AN INTERESTING FACT.

Well, what would a sysop who had instant access to all that find interesting? Barringer shrugged. *The Battle of Bunker Hill really took place on Breed's Hill.*

THAT IS CORRECT. THANK YOU. WHAT'S YOUR PLEASURE?

He did something he could have done in person, something that he could easily do at work. He got Jean McGillicutty's phone number and address.

WANT MORE? TELL ME ANOTHER INTERESTING FACT.

Ted Williams was the greatest player in baseball history.

AN INTERESTING OPINION, BUT I NEED FACTS.

Could it catch a fib? The Potomac is the longest river in the world.

THAT IS INCORRECT. TELL ME A CORRECT AND INTERESTING FACT.

2 and 2 is 4.

THAT IS NOT INTERESTING. YOU HAVE ONE MORE CHANCE, OR I WILL HAVE TO SIGN YOU OFF.

The aircraft carrier USS Theodore Roosevelt is the largest vehicle ever built by man.

THAT IS CORRECT. THANK YOU. WHAT'S YOUR PLEASURE?

He checked the latest betting line for the World Series and signed off.

Barringer sat there staring at the Kaypro's screen for ten minutes, motionless. This had to be the biggest, most

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blatant, most thorough-going data-theft he had ever seen. the Friendly Neighbors system operator was good at what he did, obviously, incredibly good, but three-quarters of the stuff on that board had to be stolen. There had to be a lot of gossip out there about Friendly Neighbors, the sort of thing most pholks wouldn't tell a phone cop for fear he'd spoil all the phun. Barringer decided he had to do some talking with a certain friend, press for some information. He used the Kaypro to call another board, the Baker Street Irregulars BBS. Barringer got in on the first try, something he had never managed before. The BSI Board was nearly always tied up. Well, who'd call anything else with the Friendly Neighbors around? All the regular boards would fall on hard times in the face of such competition. Too bad, too. The BSI BBS was a good board, full of fun things to do and try, all of them legal.

It was run by Sidney Zamoiski, one of Barringer's rephormed phreaks, one of his sources of information. Barringer signed in, went to the message section, and left a brief note, garbled in its historical and literary roots but clear to sender and receiver.

Doctor Watson. Come here, I need you. The game's afoot. He didn't leave his name.

Zamoiski would be in Barringer's office no later than noon the next day. Barringer shoved the cats to one side of the bed and tried to get some sleep.

The next day was Saturday, but it wasn't at all unusual to see Barringer in the office on weekends. It gave him the chance to catch up on things, to clear his decks for the new week. It was easier for him to concentrate without the usual bustle of people around. For that matter, Barringer spent more time out of the office, away from the weekday crowds, than was really expected of him. He was nervous around too many people.

That didn't matter now. It was a bright, clear morning, the place was deserted, he had a fresh hot thermos of coffee along, and he could track down Friendly Neighbors.

The first thing to try was the lazy way. He called a private C&P line.

"Internal Services Operator."

"Yes, this is employee Clifford Barringer."

"Hey, Cliff! Joe Walker here. How are you?"

"Oh, all right." Walker was another person Cliff had never actually seen, and therefore didn't quite believe in.

"Got some business to do?"

"Sure do."

"Okay, let's go by the book. Punch up your access authority code."

Cliff used his phone's touch-tone buttons to enter an eight-digit number.

"Thanks, Cliff. You're you, all right. What do you need?"

"Gimme a customer name and address on this number." He punched in the Friendly Neighbors number.

"That Maryland? Area code 301?"

"Sure is."

"Cliff, where you been? That exchange isn't even hooked up!"

"Get serious, I reached that number last night."

"I'll run the CNA, but I'm telling you that ain't a live exchange."

Barringer waited as Walker ran the query.

"Not in service, Cliff."

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"Run it again. I swear I called that number last night."

"Okay." There was another slight pause. "Nothing. Zip. It's not there. Check your own books, man, that's not a live exchange."

"I'll do that. Thanks, Joe." Barringer was beginning to get a sinking feeling at the pit of his stomach. He checked the telco's handbooks. It *was* a deader. But that was impossible. People had very occasionally managed to tap a bandit phone line into the system, though few even bothered to try. It was just too tough, too hard to hide, too expensive. But one bandit phone line would be child's play up against creating a bandit *exchange*. And why do it? To have access to lots of lines? But there were up to 10,000 phone numbers on an exchange. Who could possibly need that many?

Walker's computer and the handbook must be dated. Billing. He'd talk to Billing. They were always up to date. He picked up the phone.

Ten minutes later he hung it up again, in a cold sweat. Billing had never charged a dime to that number. It didn't exist. And Billing confirmed that the whole exchange had never been hooked up.

In desperation, he tried the Criss-Cross directory, which listed phone numbers in order against the customers. Nothing, of course.

He nearly jumped a foot when his own phone rang. He picked it up as if it were possessed. This morning he was starting to get confirmation of his most secret fear—that *all* telephones everywhere were and always *had been* possessed.

But it was only Security downstairs, asking if Sid Zamoiski could be escorted up. Barringer said yes, and five minutes later one of the uniforms from downstairs delivered Zamoiski. "Doctor Watson, I presume," Barringer said as he stood to shake Zamoiski's hand.

"Hey, Cliff," Zamoiski said. "I've been waiting for your call for a while now." Zamoiski sat himself down in the visitors chair and grinned. He didn't look like a hacker. He looked more like a surfer, or a lumberjack. A big, dark-haired, burly young man with a handlebar moustache; it was hard to imagine him hunched over a computer fooling with disk drives and monitors.

"Thought you might be. Friendly Neighbors?" Barringer said.

"Uh-huh. What name did you get in under?"

"William Heller. Why?"

"Thought so. Try it now, under you own name."

Barringer looked oddly at Zamoiski and turned to the IBM PC on his desk. Thirty seconds later he was on-line to Friendly Neighbors.

WHAT IS YOUR FIRST AND LAST NAME?

Cliff Barringer

YOU'LL NEVER TAKE ME ALIVE, COPPER! AND NEXT TIME DON'T BOTHER CALLING FROM A TELCO OFFICE NUMBER.

The PC's screen filled with gibberish as Friendly Neighbors cut the connection.

"My God," Zamoiski said. "I didn't know it could trace the line."

"It knows who I *am?*" Barringer thought he might faint.

"Doctor Devious—you know, the pet shop owner in Takoma Park who runs a board—told me that he had told

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Friendly Neighbors who all the phone cops were. That was an Interesting Fact. But if it can trace calls, I'm surprised it allowed a call from your home phone."

"Listen, with all you wireheads out there ready to do me in, I've got the most unlisted number on Earth. The telco switching system thinks my phone is across the county line, in Prince George's County. I've got three lines cross-connected through legal cheeseboxes to keep phreaks from finding my home. C&P okayed it."

"Mmmph."

"And if you breathe a word of that you've had your last Chinese dinner on me. How long has Friendly Neighbors been in business?"

"Not long. Somebody left the message on my BBS about a month ago that there was this great new board to try."

"Has it grown since, or did it start out with all that stuff?"

"A few goodies around the edges, but mostly the sysop had it ready to go when he started."

"What the hell is this interesting fact routine?"

"Got me. And don't ask me why it asks for facts and then tells you 'that is correct.' If it knows, why ask? And here's another weird thing. It's programmed so it won't let me repeat a fact *I've* already given, but up to a point it'll let me tell it something I know it's heard from one of the other guys. But if I overdo it, it tells me I'm being lazy and demands fresh facts."

"I tried to fib to it, and it caught me," Barringer said. "How could a program be that smart? Think this guy actually licked the artificial intelligence problem?"

"You know my theory, Holmes. We won't get anywhere on artificial intelligence unless we perfect artificial stupidity first. I dunno. Maybe this sysop *has* done it. And get this: Devious said he tried reading it cards from *Trivial Pursuit*. Friendly Neighbors caught him and told him to knock it off."

"Jesus. This is getting me more and more worried. Especially since I can't find them." Barringer quickly ran through his attempt to get an address for the board.

"That's creepy." Zamoiski thought for a moment, and suddenly laughed out loud. "Wait a second. I think I know how we can find them. But not from here. We'll go to my place."

Zamoiski lived in a blank-faced high rise apartment building in Silver Spring. The place was strangely neat and spare for a bachelor's home. It looked almost barren, as if Zamoiski camped there instead of living there. Only one part of the place looked truly occupied: a mammoth desk covered with hardware and manuals and tools and carry-out food containers. Zamoiski used a Sanyo for most of his hacking. He went straight to it and signed on to Friendly Neighbors. Because he was an experienced user, the system skipped the rules and the catalog of services and went straight to

TELL ME SOMETHING MORE ABOUT THE BATTLE OF MIDWAY

"Uh-oh," Zamoiski said. "Every once in a while it gets interested in a topic you've told it something about and does this. Let's see."

The ships of the opposing fleets never saw each other.

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THAT IS CORRECT. WHAT'S YOUR PLEASURE?

Zamoiski callled up the criss-crossing section of the phonebook service. "Let's just see how dumb this genius computer is." He asked for the home address matching Friendly Neighbor's phone number.

Friendly Neighbors obediently betrayed its own location.

"Stratford Lane, Bethesda," Barringer read. "Zamoiski, you're a genius."

"Not really. But I'm glad to prove my theory about artificial stupidity. Never seen a machine that wasn't dumb if you asked it the right question. Now what?"

"Well," Barringer said, "I could act police and wait until Monday and get a warrant and go in there with some regular cops and so on—but dammit, I gotta *meet* this guy!"

"We go over now?"

"Yeah. Who could resist?"

Stratford Lane was one block long, a quiet little suburban road cut into the side of a gentle hill, full of sixty-year-old brick houses. Children played in the yards and ran back and forth across the quiet street. All the lawns were neatly kept, all the houses were well cared for. Except one, toward the Wilson Lane end of the block.

Barringer checked the address again. It matched, but it couldn't be right. The house, set back a bit from the road, and on the uphill side of the street, was barely visible from the road, hidden behind bramble and high trees and a tangle of undergrowth that seemed not just to have grown, but *evolved* from a lawn left unmowed for a quarter-century. What could be seen of the house itself did not inspire confidence. It had been painted brick many years before, but the paint had faded and flaked off until it required more imagination than honesty to call the exterior walls white. The shutters were closed, but looked rotted and about to fall off. The slate roof seemed ready to slide off in one piece. Worn, broken, half-collapsed stone steps led up to an overgrown path through the front-yard forest to the front door. An ancient and decrepit blue and white Anglia two-door resting on four flat tires blocked the way up the stairs.

The two friends pushed the bramble far enough out of the way to squeeze around the car, and headed for the front door of the house. Barringer happened to glance up as they made their way along the short path. He stopped short and grabbed Zamoiski's sleeve. "Sid. Look up at the utility pole."

"What the hell—?"

Hanging from the pole and running into the second floor of the house was a cable as thick as a man's arm. It was dark green, and it didn't look so much connected to the junction box on the pole as *melted* to it.

Barringer shook his head and headed for the front door. Zamoiski was impressed with Barringer for having the nerve to knock, not at all surprised when nothing happened, taken aback when Barringer tried the knob and astonished when he was able to open the door. It hadn't been locked.

Barringer stepped inside the door, turned, and called to Zamoiski. "You got a flashlight in your car?"

"Yeah, I'll get it." Zamoiski was glad of a reason to get away from the

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house, but not at all happy about having to go back. The door was wide open and Barringer stood in it, waiting impatiently. Zamoiski stepped inside and handed his friend the light.

Barringer flicked on the flashlight and looked around.

The entire interior of the house had been removed, down to the lath. The floor was a slab of pinkish concrete, and Barringer had the feeling the concrete filled the house's foundation from the cellar to ground level in one solid block. That melted green cable came through the wall over the door, and led to a—*thing*. Barringer didn't know what to call it. It was a boxy shape, about four feet square, of the same dark green color as the cable. It looked half-melted, too, its shape softened, rounded, droopy.

Another green cable led to a device Barringer and Zamoiski both recognized instantly.

There are certain machines that must be certain shapes if they are to work. A square wheel cannot roll, a lever must be long and thin to do any good, a knife must have a cutting edge.

Zamoiski gasped as Barringer shone the light on a twelve-foot diameter, bright-green, well-polished, very handsome parabolic dish antenna. They'd have to do some measurements, and get some tracking done, but to Zamoiski that would merely be confirmation. Somewhere in deep space, the system operator of the Friendly Neighbor Bulletin Board was hard at work. "I always said hackers and phreaks were weird enough to get along with anyone," Zamoiski said.

"Try weird enough to talk to aliens without noticing," Barringer said. He was surprised because he *wasn't* surprised. Somehow, he had always been expecting this. "I suddenly understand the interesting fact rule. Our Friendly Neighbors tap into all these great data sources somehow—but they have no idea what's what. Which is the junk no one cares about, garbage that's just accumulated and clogged up the world's databases? Which is the good stuff the people really care about? We tell them what we find interesting. And they don't mind two people telling the same fact because that just tells them it's interesting to more than one person."

"I shudder to think they're getting their view of mankind from hackers," Zamoiski said. "I gave the poor guys some really dumb stuff. Very few civilians would care about how to do automatic baud-rate shifting for a Sanyo MBC. I dunno. What do we do now?"

Barringer looked at the half-melted green box. "We talk to them. Their mainframe here doesn't have a local terminal. I guess we get to a phone and sign on. Let's go to my place. It's closer."

TELL ME AN INTERESTING FACT

Barringer looked at his friend. "Well, what do we say? How do you politely say we caught you spying on our planet?"

Zamoiski reached for the keyboard. "They aren't spying. Just looking around. And that door wasn't locked. They must be expecting us. Lemme get their attention." *The sysop of this board is an extraterrestrial*, he typed.

For the first time, there was a pause before the program responded. Then, finally, a message came up on the screen.

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HELLO, NEIGHBOR. YOU ARE NO LONGER LIMITED TO THE SMALLER BEGINNER'S BOARD. YOU HAVE JUST QUALIFIED FOR PROVISIONAL MEMBERSHIP IN THE MAIN BULLETIN BOARD SYSTEM. DO YOU WISH TO JOIN?

"Damn straight I do," Zamoiski said. *Yes,* he typed.

THE RULES OF THE BOARD ARE SIMPLE. TELL US ABOUT YOU, AND WE'LL TELL YOU ABOUT US. ANSWER ONE OF OUR QUESTIONS, AND GAIN ACCESS TO ONE SERVICE.

MAKE SURE YOUR PRINTER IS ENGAGED AND SAVING A HARD COPY, THEN ENTER "READY." WE WILL DISPLAY AN OVERVIEW LISTING OF SERVICES AND INFORMATION AVAILABLE.

Zamoiski switched on the printer and typed *ready*. The choices scrolled past the screen. None of them made sense at first, but a lot of them seemed like fun. What looked like databases on a hundred planetary systems, instructions on how to build some extrememly entertaining gadgets, telecomputer courses on any number of subjects, games that he just had to try. Zamoiski suddenly felt worried about losing it all before he had a chance to play. If the local authorities or the Feds, or even worse, the phone company, found out, they might shut it down, for failure to pay one hell of a long distance bill. Zamoiski had an oddly parochial world view. "Cliff," he asked, "we don't have to tell anyone else about this, do we? I mean, Earth people, like the Air Force?"

"Sid. This isn't something little like the time you busted into the bank and 'corrected' your balance. This is big, this is for real. The history of humanity and all that. We *gotta* tell. The Feds have to get started and find out some stuff. Who are these guys? Just alien hackers fooling around? An invasion? And what kind of information are they going to want from us? Anthropology? Missile secrets? We still don't know if they're really friendly."

The listing finally ended.

NOW THEN, OUR FIRST REQUEST.

Again, a pause. Barringer held his breath and debated yanking the keyboard back from his friend. But Zamoiski could simply go to any computer in the world and call on his own. The cat was out of the bag, the can of worms was opened. And Zamoiski was just crazy enough to show the Neighbors how he had patched into the Lawrence Livermore Lab computer that time, in exchange for an hour of gaming. What would they want to know?

The screen cleared. Another pause. And then, on the screen—

TELL US MORE ABOUT TED WILLIAMS.

Barringer sighed in relief. "I think," he said, "it's going to be all right." ■

● We are restless because of incessant change, but we would be frightened if change were stopped.

Lyman L. Bryson

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on gaming

Matthew J. Costello

The problem with most science fiction board games has been their inability to capture the essence of the tale. All the hardware is there, but the human (or humanoid) adventure is usually missing.

West End games has been taking major steps to correct that situation with a series of imaginative, amusing games based on the Star Trek saga. The first game to be released, *Star Trek-The Adventure Game,* was a witty paragraph board game which very much captured the fable-like flavor of Kirk and company's exploration of the Final Frontier. This was quickly followed by the exciting multi-player game, *The Enterprise Encounter*, designed by the team that created the popular *Cosmic Encounter*.

Now there's *Star Trek III* (West End Games Inc., 251 West 30th Street, Suite 11, New York, NY 10001; $17) and it may be the best SF game released in many a stardate. Actually, it's the best three games, for *Star Trek III* consists of 3 very engaging solitaire games—a veritable hat trick of game design. Included are the 400 counters needed for the games, 3 very well written rule books featuring 'scene-setting' stories by John M. Ford, 3 colorful map boards, and a counter tray. Suffice it to say that you get your money's worth in this package.

My favorite of the trio is *The Sherwood Syndrome*. The Federation Developmental Aid Vessel Archon II was illegally sent to Syngreal to help the Syngrealans bring their culture from its present status (approximately 12th Century Europe) to the present day. Unfortunately, the crew of the Archon II have disappeared (to become prisoners of the King) and the Enterprise is ordered to rescue them. But Kirk must do so without creating any massive disruptions by using the high technology at his disposal. And so, the merry crew of the Enterprise don forest green suits and feathered caps, and beam down to the planet. There they raid and loot the corrupt kingdom of King Eyven.

The object of the game is to free the Archon II prisoners and stir up a rebellion against the wicked king. Once on the planet, the crew, posing as rebels, can take actions like moving, recruiting, raiding, 'requesting' donations, aiding the poor, requesting sanctuary, and stealing horses. Any use of phasers or beaming down help from the Enterprise raises the Witchcraft Index by one, and if it hits 10 the game is lost. Time is important since the Royal Party is circling the towns and obtaining oaths of fealty that, if completed, will seal the King's despotic rule. The King's Guards, meanwhile, are in hot pursuit of the 'rebels'.

Sound familiar? Of course it does, and *The Sherwood Syndrome* certainly has the feel of a Star Trek episode. The

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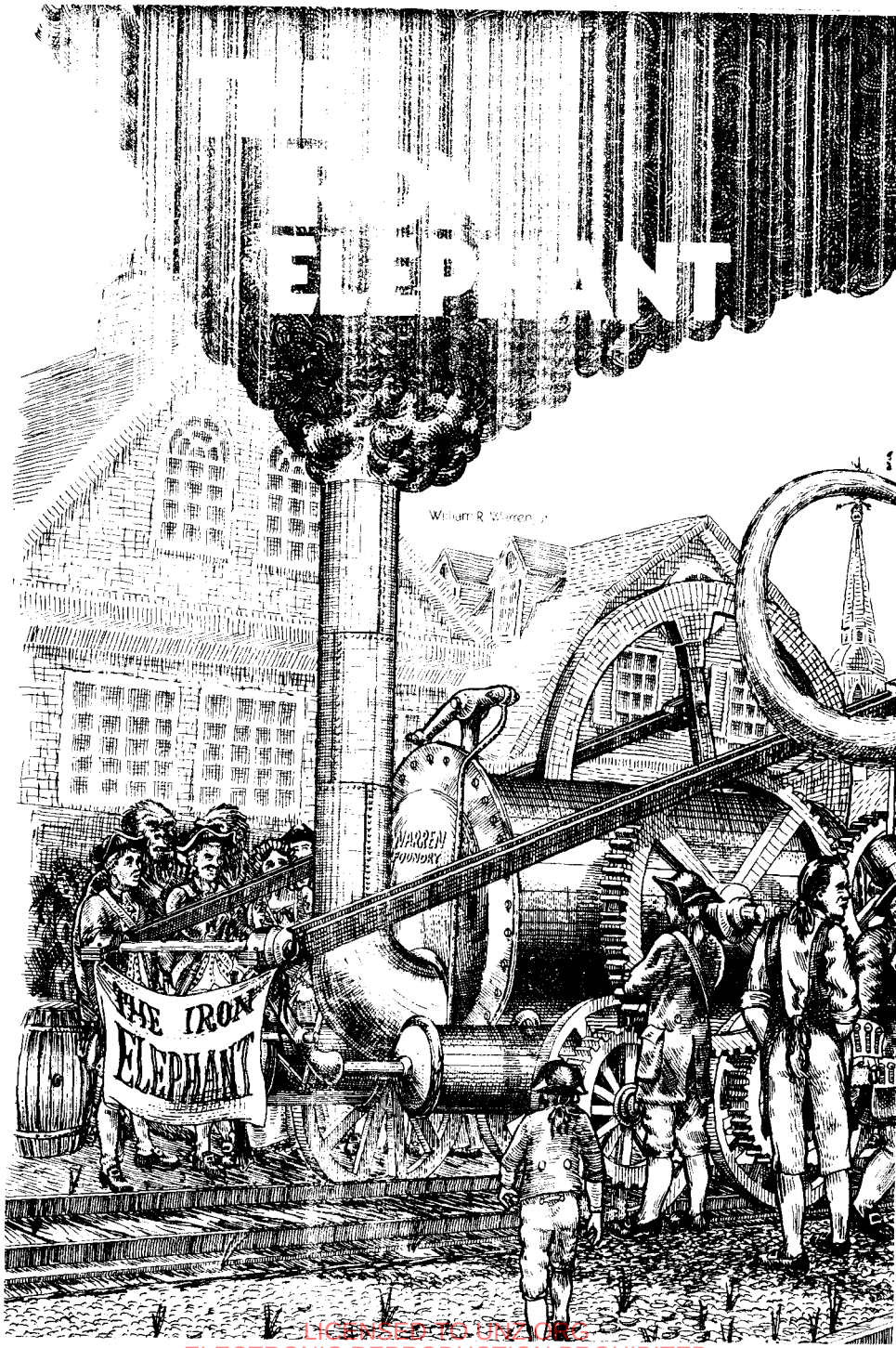

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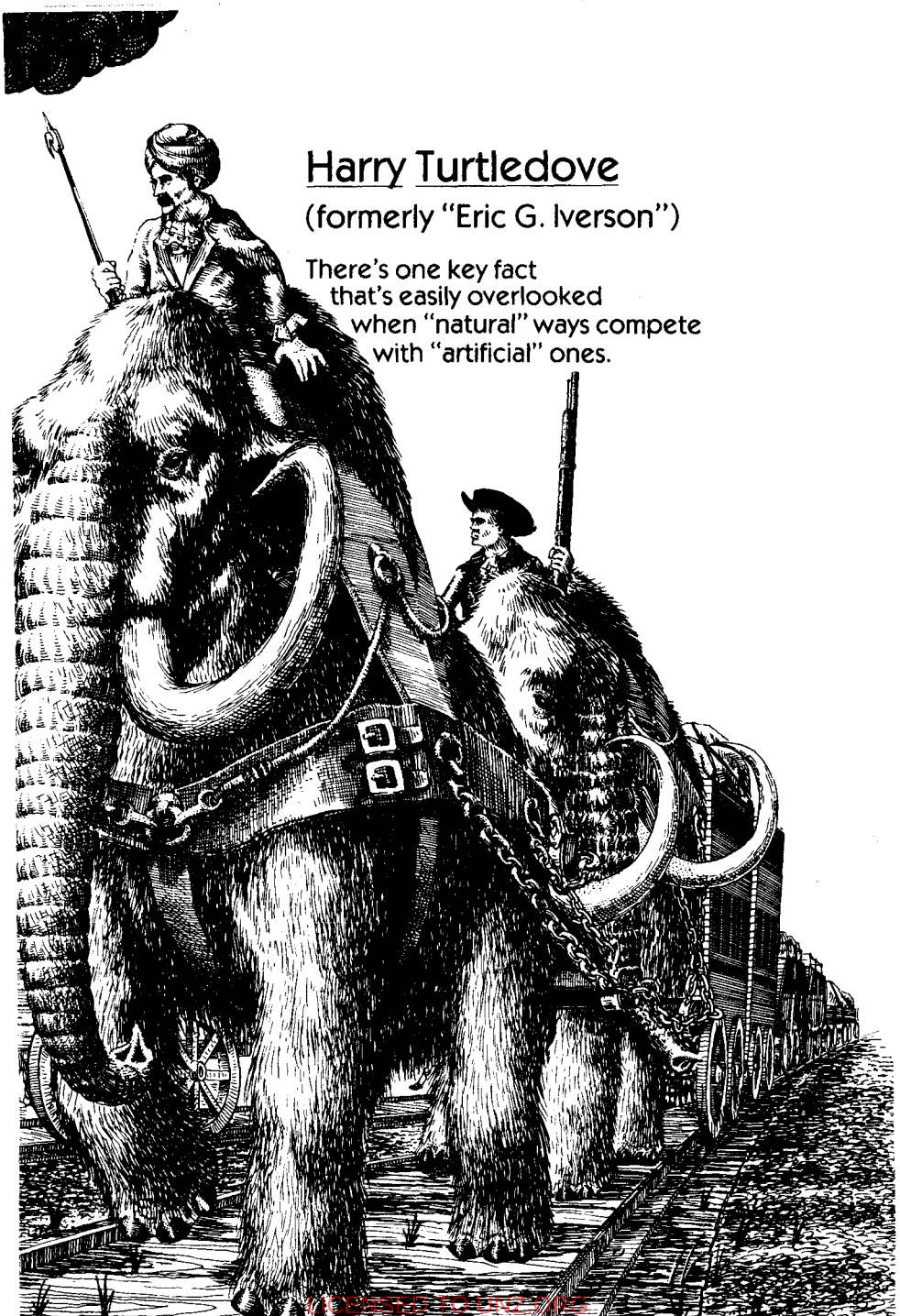

Harry Turtledove

(formerly "Eric G. Iverson")

There's one key fact
that's easily overlooked
when "natural" ways compete
with "artificial" ones.

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The train rattled east across the prairie toward Springfield. Prem Chand kept his rifle across his knees, in case of sims. From his perch atop Caesar, the lead hairy elephant, he could see a long way over the grassland.

"We should make town in another hour," Paul Tilak called from Hannibal, the trail beast. "An easy trip, this one."

Prem Chand turned around. "So it is, for which I am not sorry." He and Tilak were both small, light brown men with delicate features. Their grandfathers had come to America when the English decided to see if elephant-handlers from India could tame the great auburn-haired beasts of the New World.

The two dozen waggons stretched out behind the pair of elephants showed that the answer was yes, though the Federated Commonwealths had been free of England for a generation. With men even then beginning to settle west of the New Nile, no country across the sea could hope to enforce its will on its one-time colonies.

"Sim!" Tilak shouted suddenly. "There, to the north!"

Prem Chand's head whipped round. He followed his friend's pointing finger. Sure enough, the subhuman was loping along parallel to the train, about three hundred yards away. Prem Chand muttered something unpleasant under his breath. Sims might have no foreheads to speak of, but they had learned how far a gun could shoot with hope of accuracy.

"Shall we give him a volley?" Tilak asked.

"Yes, let us," Prem Chand said. Three hundred yards was not quite impossibly long range, not with more than a dozen rifles speaking together. And the sim's arrogant confidence in its own safety irked the elephant driver.

He waved a red flag back and forth to make sure the brakemen posted on top of every other car saw it. Tilak peered back over his shoulder. "They're ready."

Prem Chand swung the flag down, snatched up his rifle. It bellowed along with the others, and bucked against his shoulder. The acrid smell of gunpowder filled his nose.

The hairy elephant beneath him started at the volley. It threw up its trunk and let out a trumpeting roar almost as loud as the gunshots. Prem Chand shouted, "*Choro*, Caesar, *choro!*—stop, stop!" Elephant commands were the only Urdu he still knew. His father had preferred them to English, and passed them on to him.

He prodded Caesar behind the ear with his foot, spoke soothingly to him. Being on the whole a good-natured beast, the elephant soon calmed. Tilak's Hannibal was more excitable; the other driver had to whack him with a brass *ankus* to make him behave. Hannibal's ears twitched resentfully.

Prem Chand peered through the smoke to see whether all that gunfire had actually hit the sim. It hadn't. The subhuman let out a raucous hoot, shook its fist at the train, and bounded away.

Prem Chand sighed. "I do not like those pests, not at all. One day I would like to unharness Caesar and go hunting sims from elephant-back."

"Men only began settling hereabouts a few years ago," Tilak said resignedly. "Sims will be less common before long."

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"Yes, but they are so clever it's almost impossible to root them out altogether. Even on the eastern coast, where the land has been settled for a hundred fifty years, wild bands still linger. Not so many as here west of the New Nile, true, but they exist."

"Mere vermin fail to worry me," Paul Tilak said. He put a hand to his forehead to shade his eyes. "We should be able to see Springfield soon."

"Oh, not yet," Prem Chand said. But he also looked ahead, and saw the thin line of black smoke against the sky. Alarm flashed through him. "Fire!" he shouted. "The town must be burning!"

He dug his heels into Caesar's shoulders, yelled, "*Mall-mall!*—go on!" He heard Tilak using the elephant goad to urge Hannibal on. The two beasts had to pull hard to gain speed against the dead weight of the train. Prem Chand hoped the brakemen were alert. If he had to slow suddenly, they would need to halt the waggons before they could barrel into the elephants ahead of them.

The line of smoke grew taller, but no wider. Prem Chand scratched his head. Funny kind of fire, he thought.

"What's burning?" a farmer called as the train rolled by—farms sprouted like mushrooms along the tracks close to town, though still scarce farther away. Prem Chand shrugged. Even then, in the back of his mind, he might have known the truth, but it was not the sort of truth he felt like facing before he had to.

Then he could see Springfield in the distance. Its wooden buildings looked quite intact. The smoke had stopped rising. The prairie breezes played with the plume, dispersing it.

Houses, stables, a church, warehouses passed in swift succession. Prem Chand guided Caesar into the last turn before the station. "*Choro!*" he called again. Caesar slowed. The brakemen worked their levers. Sparks flew as the waggons' iron wheels squealed on the track. The train pulled to a halt.

"Seventeen minutes ahead of schedule," Paul Tilak said with satisfaction, checking his pocket watch. "No one will be able to complain we are late on this run, Prem."

"No indeed," Prem Chand said. "But where *is* everybody?" Their being early was no reason for the eastbound side of the station to be empty—they had been in sight quite a while. Where were the men and tame sims to unload the train's freight? Where were the people coming to meet arriving passengers? Where were the ostlers, with fodder and water and giant currycombs for the elephants? Come to think of it, where had the small boys who always gawked at the train disappeared to?

Prem Chand tapped Caesar's left shoulder, as far down as he could reach. The hairy elephant obligingly raised his left leg. Prem Chand shinnied down to the broad, leathery foot, then dropped to the ground.

A passenger stuck his head out the window of a forward waggon. "See here, sir," he called to the elephant driver, "what is the meaning of this? I am an important man, and expect to be properly greeted. I have business to transact here before I go on to Cairo." He glared at Prem Chand as if he thought everything were his fault.

"I am very sorry, sir," Prem Chand

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said politely, which was not at all what he was thinking. "I will try to find out."

At that moment, a door in the stationhouse opened. Finally, Prem Chand thought, someone's come to take a look at us. It was George Stephenson, the stationmaster, a plump little man who always wore a stovepipe hat that went badly with his build.

"What is the meaning of this?" Prem Chand shouted at him, stealing the pompous passenger's phrase. "Where are the men to take care of the elephants?" To a driver, everything else was secondary to that.

Stephenson should have felt the same way. Instead, he blinked; the idea did not seem to have occurred to him. "I'll have Willie and Jake get round to it," he said grudgingly.

"Get round to it?" Prem Chand clapped a hand to his forehead in extravagant disbelief. "How else will they make enough money for their whiskey? What is wrong with this town today? Has everyone here gone out of his mind?"

"Not hardly," Stephenson said. He was looking at Caesar and Hannibal in a way Prem Chand had never seen before—was that pity in his eyes? "We've just seen the future, is all. Maybe you better take a peep too, Prem, so as you and Paul there can start huntin' out a new line of work."

Then Prem Chand did know what had happened, knew it with a certainty that gripped his guts. Even so, he had to make Stephenson spell it out. "You mean—?"

"Ayah, that's right, Prem. One o' them newfangled steam railroad engines has done come to Springfield. How do you propose outdoin' a machine?"

The pennant tied to the front of the steam engine called it "The Iron Elephant." To Prem Chand, the name was an obscene parody. The upjutting smokestack reminded him of Caesar's trunk, yes, but that trunk frozen in rigor mortis. Painting the boiler red-brown to imitate a hairy elephant's pelt did not disguise its being made of iron. And the massive gears and wheels on either side of that boiler seemed to Prem Chand affixed as an afterthought, not parts of the device in the way Caesar's great legs were part of him.

Besides, the thing stank. Used to the clean, earthy smell of elephant, Prem Chand's nostrils twitched at the odors of coal smoke and damp, cooling iron.

Had he been able to get closer, he thought, he probably would have been able to find other things to dislike about the Iron Elephant. As it was, he had to despise the contraption at a distance. Almost everybody in Springfield had jammed into the westbound side of the station to stare at the steam engine.

Stephenson turned to Prem Chand, saying, "I know you'll want to meet Mr. Trevithick, the engine handler, and compare notes. He's been waiting here for you. Come on, I'll take you to him." He plunged into the crowd, using his weight to shove people aside.

Meeting this Trevithick person was the last thing Prem Chand wanted. He also had a schedule to keep. He grabbed Stephenson by the shoulder. "Of course he's been waiting—he only has that damned engine. Me, I have an entire train to see to. You have my elephants

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fed, this instant. You have them watered. You unload what comes off here, and get your eastbound freight on board. Get your passengers moving. If I am one minute late coming into Cairo on the New Nile, I will complain to the company, yes I will, and with any luck we will bypass Springfield afterwards."

He knew he was bluffing. Likely Stephenson did too, but he could not afford to ignore the threat. Without a rail stop, Springfield would wither and die. With poor grace, he started pulling stationhands out of the crush, and shouting for passengers to get over to the eastbound track. The press of people thinned, a little.

"Satisfied?" the stationmaster asked ironically.

"Better, at any rate," Prem Chand said.

"One fine day soon you won't be able to throw your weight around just on account of you drive elephants, Prem. When steam comes in, we won't need stables, we won't need the big hayyards. This operation'll run on half the people and a quarter the cost." Stephenson rubbed his hands at the prospect.

"And what do you do, pray tell me, when one of these engines breaks down? Whom will you hire? How much will you have to pay him? More than your ostlers or a leech, I would wager. And how long will the repairs take? Caesar and Hannibal are reliable. What sort of schedule will you be able to keep up?"

"The Iron Elephant's reliable too," Stephenson insisted, though Prem Chand's objections made him sound as if he were also trying to convince himself. But his voice steadied as he went on, "It's steamed all the way out from Boston in Plymouth Commonwealth without coming to grief. I reckon that says somethin'."

In spite of himself, Prem Chand was impressed: that was more than 1,300 miles. Still, he said scornfully, "Yes, hauling nothing but itself and its coal-waggon." No passenger coaches or freight waggons stood behind the Iron Elephant. "How will it do, pulling a real load?"

"I don't know anything about that. Like I told you before, fellow you want to talk to is the engine handler. Come on, Prem—you may as well. You know they'll be a good while yet over on the other side."

"Oh, very well." Prem Chand followed Stephenson as the stationmaster forced his way through the crowd, which had thinned more while they argued.

"Mr. Trevithick!" Stephenson called, and then again, louder, "Mr. Trevithick!" A pale, almost consumptive-looking young man standing by the traveling steam engine lifted his head inquiringly. "Mr. Trevithick, this here is Mr. Prem Chand, the elephant driver you wanted to see."

"Ah!" The engine handler broke off the conversation he was having, came hurrying over to pump Prem Chand's hand. "They spoke very well of you in Cairo, sir, when I was arranging permits to travel this line—said your Caesar and Hannibal were first-rate beasts. I see they were right; you're here a good deal ahead of schedule." Like any railroad man, Trevithick always had a watch handy.

"Thank you so very much, sir."

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Prem Chand saw he was going to have to work to dislike this man; Trevithick was perfectly sincere. Looking into his intense blue eyes, Prem Chand suspected he was one of those people who always said just what they thought because it never occurred to them to do anything else.

"Call me Richard—couldn't stand going as Dick Trevithick, you know. And you're Prem? Shouldn't be any stuffiness between folks in the same line of work."

Again, Prem Chand realized that he meant it. As gently as he could, he said, "Richard, it is a line of work that you and that—thing"—he could not make himself call it the Iron Elephant—"are trying to get me out of."

"Am I? How?" Trevithick's surprise was genuine, which in turn surprised Prem Chand. "Who better to work the railroads under steam than someone long familiar with them as an elephant driver? Everything about them will be the same, except for what pulls the waggons."

"And, Richard, with all respect, everything about iron and wood is the same, except when I need to start a fire. I've spent a lifetime learning to care for elephants; what good will that do me in dealing with your boiler there?"

"A child could manage the throttle. And we have a whole new kind of boiler in the Iron Elephant, with tubes passing through it to heat the water more effectively. And the cylinders are almost horizontal, and work much better than the old vertical design did." Trevithick glowed with enthusiasm, and plainly wanted Prem Chand to catch fire too. "Why, on level ground, with the extra power the new system gives, we can do close to thirty miles an hour—practically flying along the ground!"

Had Stephenson named the figure, Prem Chand would have called him a liar on the spot. He did not think Trevithick a man given to exaggeration, though. Thirty miles an hour! He tried to imagine what the wind would be like, whipping in his face: as if he were on a madly galloping racehorse, but for some long time, not just the few minutes the beast would take to tire.

"How about that, Prem?" Stephenson put in, nudging him in the ribs. "Only way you'd get Caesar and Hannibal moving that fast'd be to drop 'em off a roof."

Prem Chand grunted. He thought of the stationmaster's boasts of a few minutes before about how much he could cut back his operation. The elephant driver smiled sardonically at Trevithick's naivete. Everything would be the same, would it?

Still—"Thirty miles an hour is a marvelous speed, Richard; it is most marvelous indeed. But that is unloaded, I take it. What can your steam engine"—he *would* not call it the Iron Elephant, not even for politeness' sake—"do, pulling a load of, say, fifty tons?"

"Tell him, Mr. Trevithick." This time the engine handler was the recipient of Stephenson's conspiratorial elbow.

He did not seem to notice. The gleam in his eyes turned inward as he calculated. At last he said, "That is a great deal of weight. Does your team really pull so much?" For the first time, his voice held a trace of doubt.

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"They can, yes," Prem Chand said proudly.

"Truth to tell, I have to wonder if the machinery could stand it. But I think we should be able to do something on the order of three miles an hour, not counting stops for water or for any breakdowns that might happen."

"Three miles an hour? Is that all?" George Stephenson sounded more betrayed than disappointed.

Trevithick looked amused. "Now you see why I tend to put more stress on the engine's top speed."

Prem Chand, though, was still impressed, and worried. His beloved elephants were faster, but they were only flesh and blood. They had to rest, where the steam engine could go on and on and on. And yet, he thought, if I can show everyone how the elephants outdo this stinking contraption—

"Richard, load your train up, and I will load mine, and I will race you from here to Carthage."

"A race, eh?" Trevithick's bright eyes glowed. "How far is this Carthage place from here?"

"Fifty-three miles, a tiny bit south of west. The railroad ends soon after it."

"Hmm." Prem Chand watched the engine handler go into that near-trance of concentration again. When he emerged from it, he gave the elephant driver a respectful look. "That will be a very close thing, Prem. You know how embarrassing—and I mean financially as well as in the sense of a blow to my pride—it would be for me to lose?"

Prem Chand returned a bland shrug. "You've come all this way from Plymouth, Richard, to show off your ironmongery. How embarrassing will it be for word to get out that you refused a challenge from your competition?"

Trevithick laughed out loud. "You misunderstand me. I have no intention of refusing. When shall we start?"

"Tomorrow morning?"

"What?" George Stephenson let out a howl. "You're eastbound for Cairo tomorrow morning, Prem! What about your precious schedule?"

"Well, what about it? If this steam engine comes in and replaces Caesar and Hannibal, then I will have to do as you suggested before and find other work, so it will not matter if the company fires me. But if elephants are better than machinery, the company should know that, too. They will thank me more for finding out than they will be angry with me for being late. And besides, George, why should you worry? Don't you own the town hotel?"

Stephenson suddenly looked crafty. "Well, yes, now that you mention it, I do."

"Here is a man who thinks of everything," Trevithick said admiringly. "I wonder if I ought to race against you after all—no, my friend, only a joke. But tomorrow morning will be too soon. We will have to load up waggons so both our trains carry equal weight . . . George, you live here, unlike either Prem or myself. Can you hire some sims from the locals to help the ones at the station here with that work?"

"Reckon so." Stephenson gave Trevithick a sidelong glance. "So long as I ain't payin' for it, that is."

Prem Chand gulped; he was never going to be rich, not on an elephant driver's salary. But Trevithick said,

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"I'll cover it, never fear. What I don't make up on bets will come back in the long run through the ballyhoo this race will cause."

"Whatever you say. All I know is, you can't put no ballyhoo in the bank. Them folks are partial to gold."

"Who isn't?" Trevithick chuckled.

Prem Chand went back to the other side of the station to stop the unloading of his train—the less that came off, the less that would have to be put back tomorrow. The strawboss who oversaw Stephenson's gang of sims looked at him as if he were crazy. "First you was screaming nobody was doing anything, now you're screaming on account of they are. Can't you make up your fool mind?"

"Truly I am sorry, Mr. Dubois." Prem Chand had always thought the strawboss more capable than Stephenson, and treated him accordingly.

Dubois only grunted in disgust, then turned and shouted to the dozen sims that were unloading sacks of grain from the waggons. He gave hand-signals to back his oral instructions. Sims could follow men's speech, but had trouble imitating it. They much preferred to use gestures themselves, and many overseers gave orders both ways, taking no chances on being misunderstood.

That care paid off now. One of the sims gaped in disbelief at the overseer. Its long, chinless jaw fell open to reveal yellow teeth bigger and stouter than any man's. It ran a hand over what would have been a human's forehead, but was in the sim only a smooth slope behind bony brow-ridges.

Back, it signed, adding the little gesture that turned the word to a question. Prem Chand usually had some trouble following hand-talk, but the sim made the sign so emphatic—the way a man might shout an objection—that he understood it with ease.

Back, Dubois signed firmly. *Put bags back.*

The sim scratched its hairy cheek, let out a wordless hoot of protest. It signed, *Bad. Very bad. Work all gone.* From its point of view, Prem Chand supposed it had a point. But under Dubois's uncompromising eye, it and its comrades began putting the produce back aboard the train.

"What are they doing, Prem?" Paul Tilak demanded. "That should go in the warehouses here—look at the bill of lading. And why were they so slow getting here in the first place? Where was everyone, and why is everyone so excited?"

Very much the same set of questions, Prem Chand thought wryly, that he had thrown at George Stephenson. They had the same answer, too: "Steam engine."

"Damnation!" Tilak shouted, so loudly that Hannibal let out an alarmed snort and swung his shaggy head to see what was wrong with his driver. "It is all right, really it is," Tilak reassured him. He snorted again, doubtfully, but subsided.

"These accursed engines will be the ruination of us," Tilak said.

"I hope not."

"Of course they will." Tilak was gloomier by nature than Prem Chand. He seemed to notice Dubois's gang of sims again. "What *are* they doing, Prem?"

Prem Chand told him. Tilak's jaw dropped. He frowned. "I do not know if we can beat this Trevithick, Prem, if

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his machine performs as he says it will."

"He does not know if he can beat us, either, which makes for a fair trial. Cheer up, Paul—even if we lose, how are we worse off? What will happen? The company will buy engines, just as it would without any race at all. But if we win, perhaps they will not."

Tilak looked unconvinced. Before the argument could go further, the passenger who had bothered Prem Chand from the coach window now grabbed him by the arm. "See here, sir! Do I understand you to mean that this train will not proceed to Cairo, but rather is returning to Carthage?"

"I am afraid that is correct, sir." As gently as he could, Prem Chand shook free of the man's grasp. "I am so very sorry for any inconvenience this may—"

"Inconvenience?" the man exclaimed. His face was almost as red as his waistcoat. "Do you know, sir, that I stand to lose out on a very profitable investment opportunity if I am delayed here?"

That was too much for Prem Chand. The deference that was part of his railroading persona went by the board. He stuck his face an inch from the passenger's nose and bellowed, "God damn you to hell, do you know that I stand to lose out on a job I have loved for twenty-five years and that my father and grandfather held before me? I piss on your investment opportunity, and for a copper sester I'd black your eye, too!"

Tilak quickly stepped between them before they could start a fight. The passenger stamped away, still yelling threats.

Prem Chand looked toward his beloved elephants. The ostlers had set out big wooden tubs of water for them. "*Derr!*" he shouted to Caesar: "Splash!" He thrust out his arm, pointing to the obnoxious fellow with whom he'd been quarreling.

Caesar snorted up a big trunkful of water, let it go in a sudden shower—that drenched Prem Chand. Tilak and Dubois got wet too, and hopped back swearing. The fellow the elephant driver had intended to soak got off unscathed.

"It has been that kind of day," Prem Chand sighed. "Fetch me a towel, please, someone."

Instead of starting the next morning, as Prem Chand had proposed, the race did not begin until three days later. Part of the delay was from loading waggons so that the elephants and the steam engine would pull about the same amount of weight. The rest came from dickering over conditions.

Since the flesh-and-blood elephants were ready at once, while the Iron Elephant had to build up steam, Trevithick wanted Prem Chand not to start until the engine could move. This the elephant driver indignantly refused, on the grounds that the startup delay was an inherent part of the mechanical device's function. Public opinion in Springfield backed him, and Trevithick gave way.

But Prem Chand had to yield in turn on the load the Iron Elephant would have to haul. He wanted the weight of the waggons added on to that of the engine and coal-waggon. Trevithick, though, neatly turned the tables on him, pointing out that the Iron Elephant naturally got lighter as it traveled and consumed its fuel. The coal, he said, should

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count as part of its initial burden. He won his point.

Most of Springfield was there to see the race begin. The Iron Elephant was on the regular westbound track; Caesar and Hannibal took the one usually reserved for eastbound trains. Trevithick doffed his dapper cap to Prem Chand. The elephant driver returned a curt nod. Trevithick was not a bad sort. If anything, that made matters worse.

The mayor of Springfield cried, "Are all you gentlemen ready?" He held a pistol in the air. It would have taken more pull than a steam engine or a couple of hairy elephants put out to keep His Honor away.

Hearing no objections, he fired the starting-gun. Caesar's ears flapped at the report. "*Mall-mall!*" Prem Chand shouted. Behind him, he heard Paul Tilak give Hannibal the same command, and emphasize it with a whack of the elephant-goad.

The hairy elephants surged forward as far as their harnesses would allow. Then, grunting with effort, they lowered their heads, dug in their big round feet, and pulled for all they were worth. Fifty tons of dead weight was a lot for even such powerful beasts to overcome.

From the other track, Prem Chand heard the clatter of coal being shoveled into the Iron Elephant's firebox. He did not look over. He knew his train would get rolling first, and intended to wring every inch out of his advantage. "*Mall-mall!*" he shouted again.

The spectators started to slide out of his field of vision. "We're moving!" he and Tilak shouted in the same breath. "*Mall-mall!*" In his urgency, Prem Chand used the *ankus* on Caesar. The elephant shook his head reproachfully.

Each step Caesar and Hannibal took came easier than the one before. Horses paralleled the track, as riders came along to watch the race. Prem Chand looked back over his shoulder. The Iron Elephant still had not moved.

"We may do this yet!" he called to Paul Tilak. He hoped so. He had bet as many big silver denairs as he could afford—and perhaps a few more—on the great animal straining beneath him.

"We shall see," was all Tilak said. As far as Prem Chand knew, he had not made any bets for the elephant. He had not made any against them, either. Had he done so, Prem Chand would have kicked him off Hannibal if it meant putting an unschooled oxherd aboard the beast. He had already fired one brakeman—he wanted no one with him who had a stake in losing.

Buildings hid the Iron Elephant as Caesar and Hannibal pulled their train round a curve. They had made a good quarter of a mile and were coming to the outskirts of town when Tilak said, "The machine is coming after us."

Prem Chand looked back again. Sure enough, a plume of steam and smoke was rising above the train station. The elephant driver grunted, sounding very much like Caesar. "Whatever Trevithick does, we are still faster, so long as we are moving. What worries me is that he will go all night."

"Do you want us to try that?" Tilak asked.

"No," Prem Chand said regretfully; he had thought long and hard about it. "If we do, Caesar and Hannibal will be worth nothing tomorrow. Even as is, I

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am not sure they will be able to match today's pace. And I am so afraid they will have to. If Trevithick's engine works as he hopes, we will have to catch him from behind."

Soon they were out among farms once more. Cows and sheep stared incuriously as the hairy elephants tramped past. Rifle-toting farmers guarded their stock. Even so close to Springfield, sims were a constant nuisance. They might not have the brains of men, but they were too clever to trap.

Prem Chand decided he was going to get a stiff neck if he kept turning around to look back, but he could not help it. He had to see the Iron Elephant in action. Here it came, with its train behind it. He put a spyglass to his eye for a better view.

He thought it even uglier moving than stationary. Shafts connected to its pistons drove small gears at either side of the back of the engine. Those, in turn, meshed with larger gears in front of them, and the larger gears joined with the ones on the outside of the engine's four wheels. Smoke belched from the stack as the contraption crawled along. Even from close to half a mile away, Prem Chand could hear it chug and wheeze and rattle. It reminded him more of a flatulent iron cockroach than an elephant.

When he said that out loud, Tilak chuckled, remarking, "The farm animals would agree with you, it seems."

In studying the Iron Elephant, Prem Chand had paid no attention to them. A quick glance showed his fellow driver to be right. The livestock had reacted to their own train as they would have toward a couple of mules hauling a wagon by them, which is to say they did not react at all.

The noisy, smoky, stinking steam engine was something else again. Animals ears went up in surprise, then back in alarm. Terrified flocks pounded across the fields, farmers trying without much luck to halt them and now and then pausing to shake fists at the Iron Elephant.

"I never thought of that," Prem Chand exclaimed. "How can these machines ever accomplish anything, if sheep and cattle and horses will not go near them?"

"Trevithick has come this far," Paul Tilak pointed out, which made Prem Chand give him a dirty look.

The sun climbed the sky. One by one, the townsfolk who had ridden out to watch the race began turning back for Springfield. It was not the sort of event to be easily watched. Neither contestant moved very fast, and they were drawing steadily farther apart. The only drama lay in who would finish first, but the answer to that was still more than a day away.

This time Tilak was the one who looked back. What he saw raised even his unsanguine spirits. "They have broken down!" he shouted.

Prem Chand slapped the spyglass to his eye. Sure enough, the Iron Elephant was barely limping along. Less smoke poured from the stack, and what there was had changed color.

The brakemen raised a cheer. "Come on, Caesar!" "Go, Hannibal, go!" "Run that hunk of tin back to the blacksmith's shop where it belongs!"

But Prem Chand kept watching. As he had been certain, Richard Trevithick was not a man to yield tamely to mis-

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fortune. The engine handler worked furiously on his machine. Once he leaped away; Prem Chand saw one of his henchmen rush up to help him bandage his hand. Together they plunged back to their repairs. After a while, the Iron Elephant picked up speed again.

All the same, Caesar and Hannibal gained on the steam engine with every step they took. They were pulling magnificently now, their heads down, their double-curved tusks—bigger by far than those of the Indian elephants Prem Chand's grandfather had fondly remembered—almost dragging the ground.

A small stream ran not far from the tracks. "They should water themselves," Tilak said.

Prem Chand hated to stop for any reason, but knew his friend was right. He raised a signal flag to warn the brakemen to stop, called, "*Choro!*" to Caesar. Tilak echoed him. The brakes squealed as they halted. The two elephant drivers unharnessed their beasts and rode them over to the creek. "I'd like to see Trevithick do *this* when his boiler runs dry," Prem Chand said. Tilak nodded.

Caesar and Hannibal lowered their trunks into the water. They squirted it down their throats, a good gallon and a half at a squirt. Tilak had been right—they were thirsty. They drank close to thirty gallons each before they slowed down.

Their exertion had also made them hot. "*Derr-tol!*" Prem Chand called: "Squirt water on your back." Caesar did. Prem Chand scrambled forward onto the hairy elephant's head to keep from getting soaked as he had in Springfield.

As the elephant drivers led their charges back to the train, Caesar and Hannibal used their trunks to uproot a couple of bushes and stuff them into their mouths. They had eaten well before the race started, and would be fed again come evening, but they were not the sort of animals to miss any chance for a snack.

"*Mall-mall!*" Prem Chand shouted, and the train headed west once more.

Behind them, the smoke that marked the Iron Elephant sank lower and lower in the east. Finally Prem Chand had to use the spyglass to see it. It never quite disappeared, though, any more than an aching tooth that has stopped hurting for the moment ceases to give little reminders of its presence.

The farms that ran west along the railway from Springfield began to peter out. Not many ran east from Carthage; the tracks had only reached it a few years before. Between the two towns was a broad stretch where the four bands of iron ran through still-virgin prairie.

A herd of big-horned buffalo grazed north of the tracks. It was not one of the huge aggregations of spring or fall, when migrating throngs made the ground shake and could delay a train for hours or days as they crossed the rail line. Prem Chand knew some of his brakemen were swearing because the buffalo were out of rifle range. He did not care himself; he did not eat beef.

A pronghorn pranced daintily by, a good deal closer than the buffalo. A gun barked. Caesar jerked beneath Prem Chand; he heard Paul Tilak cursing and pounding Hannibal back under control.

When Prem Chand could spare a moment, he saw the pronghorn lying in

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the grass, kicking. He raised an eyebrow, impressed at the shooting. The little antelope was at least as far away as the sim a whole volley had missed on the way to Springfield.

Several men swung down from the waggons to pick up the pronghorn. All but one—presumably the fellow who had killed it—had rifles at the ready. The waist-high plains grass could hide almost anything—sims, wolves, a spear-fanged cat.

The brakemen had to run hard to catch up to the train with their booty. None of them called to Prem Chand to slow down. They knew what the odds were for that.

The elephant driver had his cap pulled low to shield his eyes from the westering sun when the train went by another creek. "What do you say we stop here?" Tilak called. "Hannibal is tired."

Prem Chand did not want to stop for anything, but he could feel that Caesar was not pulling as powerfully as he had earlier in the day either. The hairy elephants were so large and strong that it was hard to think they could wear out, but they did. Elephant drivers forgot it at their peril, and their beasts'.

"We will stop," Prem Chand sighed.

They made a big fire to keep off purely animal predators, and set guards in case any sim hunting band nearby was without flint and steel. Trappers and hunters who traded with the subhumans for pelts always got more for fire-making tools than anything else: before men came to the New World, sims kept fires going if they found them, but had not known how to kindle flames themselves. Now, most of them could.

It was not the sort of thing to take for granted, though.

Roasting pronghorn made Prem Chand's nostrils twitch and his belly rumble. Before he thought about food for himself, he saw to Caesar. The hairy elephant drank nearly as much as it had earlier in the day. Prem Chand lugged out bales of hay and set them in front of Caesar. As he watched, a couple of hundredweight vanished down the beast's throat. He gave Caesar a cabbage for a treat. A single crunch and it was gone.

Not far away, Paul Tilak was similarly tending Hannibal. He glanced over to Prem Chand. "We are lightening our train somewhat, also," he said.

"Well, so we are," Prem Chand admitted, "but not as much as Trevithick." He wondered how far behind the Iron Elephant was; as the eastern sky darkened, the smoke plume became indistinguishable against it.

The pronghorn proved gamy and tough, but it was more appetizing than the salt pork Prem Chand had brought from Springfield. He washed it down with beer. The crew emptied more than one barrel. In that way too, Prem Chand thought wryly, the train was getting lighter.

He spread his bedroll under him. The night was too fine and fair to need more in the way of covers than a mosquito net. He fell asleep in seconds, as he usually did after a day aboard Caesar. The next thing he expected to see was dawn streaking the eastern sky with pink and gold.

When he woke and found darkness all around him, his first fuzzy thought was of marauding beasts or sims. His

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hand slid automatically toward the rifle beside him as he sat up.

He was not the only one awake; the whole camp was stirring. In the red light of the fire's ember men looked this way and that, wondering like Prem Chand where the trouble lay. The elephant driver scratched his head. He saw nothing amiss, heard no cries or gunshots to show someone beset.

All the same, his ears had wakened him. The chugging rumble from out of the east grew louder as he listened. It sounded different against night's stillness from the way it had in Springfield, but he did not take long to figure out what it was.

"That damned steam engine," someone muttered, putting his own thoughts into words.

Soon he could see it as well as hear it. The smoke shooting up from its stack was laced with glowing sparks. "By day in a pillar of cloud, and by night in a pillar of fire," a brakeman quoted.

Caesar and Hannibal trumpeted as the Iron Elephant drew level with them, but it made more noise than both of them together. Through the hiss and clatter, Prem Chand heard Trevithick call, "See you in Carthage, sleepyheads!" His crew whooped as they passed their competitors.

They got curses back aplenty. "We will see who sees whom!" Prem Chand shouted. By then the Iron Elephant had gone a good deal farther down the track; Prem Chand heard that Trevithick replied, but could not make out his words.

Paul Tilak asked the most important question in the world just then: "What time is it?"

Prem Chand squinted to read his watch by fading firelight. "Half past two."

"Two and a half hours to sunrise," Tilak mused. "They will have a lead of seven miles or so if we wait."

Everyone looked at Prem Chand. He could see people making the same mental calculations he was. "We stay," he said at last. "We can catch them before noon, a few miles outside Carthage. And if we race them now we risk running the elephants into the ground. They worked hard yesterday, and they need as much rest as they can get."

The brakemen accepted his decision without argument, as he would have taken their word over anything concerning the waggons. Tilak, though, took him aside and said quietly, "I hope we *can* catch them. Hannibal was flagging badly there at the end yesterday."

"Caesar too." Prem Chand hated to make the admission, as if saying it out loud somehow made it more real. He was, however, far from giving up hope. "The steam engine has its problems too—I thought it would. If it were running as well as Trevithick claimed it could, it would have been here hours ago."

"And if it had, we could have waved goodbye to the race."

"That is true. But it came by now, not then. We, at least, know how far we can hope to go on any given day. What will that smelly piece of ironwork do to schedules?"

"It has certainly played the very devil with mine." Tilak yawned. "I am going back to bed."

"There, for once, my friend, I cannot argue with you," Prem Chand said. His only consolation was reflecting that

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Trevithick probably needed sleep even more than he did.

After eating enormously at sunrise, Caesar and Hannibal seemed eager to pull. The train rattled forward at a pace better than Prem Chand had expected. The Iron Elephant's plume of smoke, which had shrunk behind them the day before, now grew larger and blacker and stood taller in the sky as they gained. Only a couple of hours passed until the steam engine's train became visible, a long, black centipede stretched out along its track.

"Go ahead and run, Richard," Prem Chand called, though Trevithick of course could not hear. "You cannot run fast enough."

The engine handler must have seen his rival's train, too, and disliked the rate at which it was gaining. He must have tied down a safety valve, for more smoke poured from the Iron Elephant's stack. All the same, the flesh-and-blood beasts continued to gain.

Closer and closer they came. Now they were only a mile behind, now half a mile. And there, heartbreakingly, they stuck. Caesar's and Hannibal's morning burst of energy faded. However much Prem Chand and Paul Tilak urged them on, they could come no closer. And as the elephant drivers watched and cursed, the Iron Elephant began to pull away once more.

Prem Chand felt like weeping from frustration. Through his spyglass, the men aboard the Iron Elephant seemed close enough to reach out and touch. Yet as he helplessly watched, they drew ever farther from him. He refused to lower the spyglass, cherishing the illusion it gave of a neck-and-neck race. And so he was watching still when the Iron Elephant slid into a pit.

Prem Chand stared, not believing what he saw. He knew how hastily this stretch of the railbed had been laid; it had only gravel underneath it, not a good solid foundation of stone and rammed earth. All the same, he had crossed the same stretch of track only a few days before, and there had been no storms since to undermine it.

But something had. Paul Tilak saw what it was. "Sims!" he shouted. Suddenly and most uncharacteristically, he burst out laughing. "Their trap caught a harder-skinned elephant than they bargained for!"

Once Prem Chand's attention was diverted from the train ahead, he too saw the subhumans rushing to the attack. Some carried wooden spears, their points fire-hardened. Others bore clubs, still others stones chipped sharp that they could throw a long way. He spied the glint of a few axeheads and steel knives, perhaps stolen, perhaps got by trade.

Tilak was right—the sims would not gorge on hairy elephant, as they hoped. But they were not fussy about what they ate—brakeman would do well enough. And with everyone thrown in a heap by the Iron Elephant's sudden and unexpected stop, only a couple of men were able to shoot at the charging hunters. After that it was a melee, and the sims were stronger, fiercer, sometimes even better armed than their foes.

Prem Chand threw up the red flag to warn his crew, then yelled "*Choro!*" as loud as he could. The train stopped. "Get Hannibal out of his harness!"

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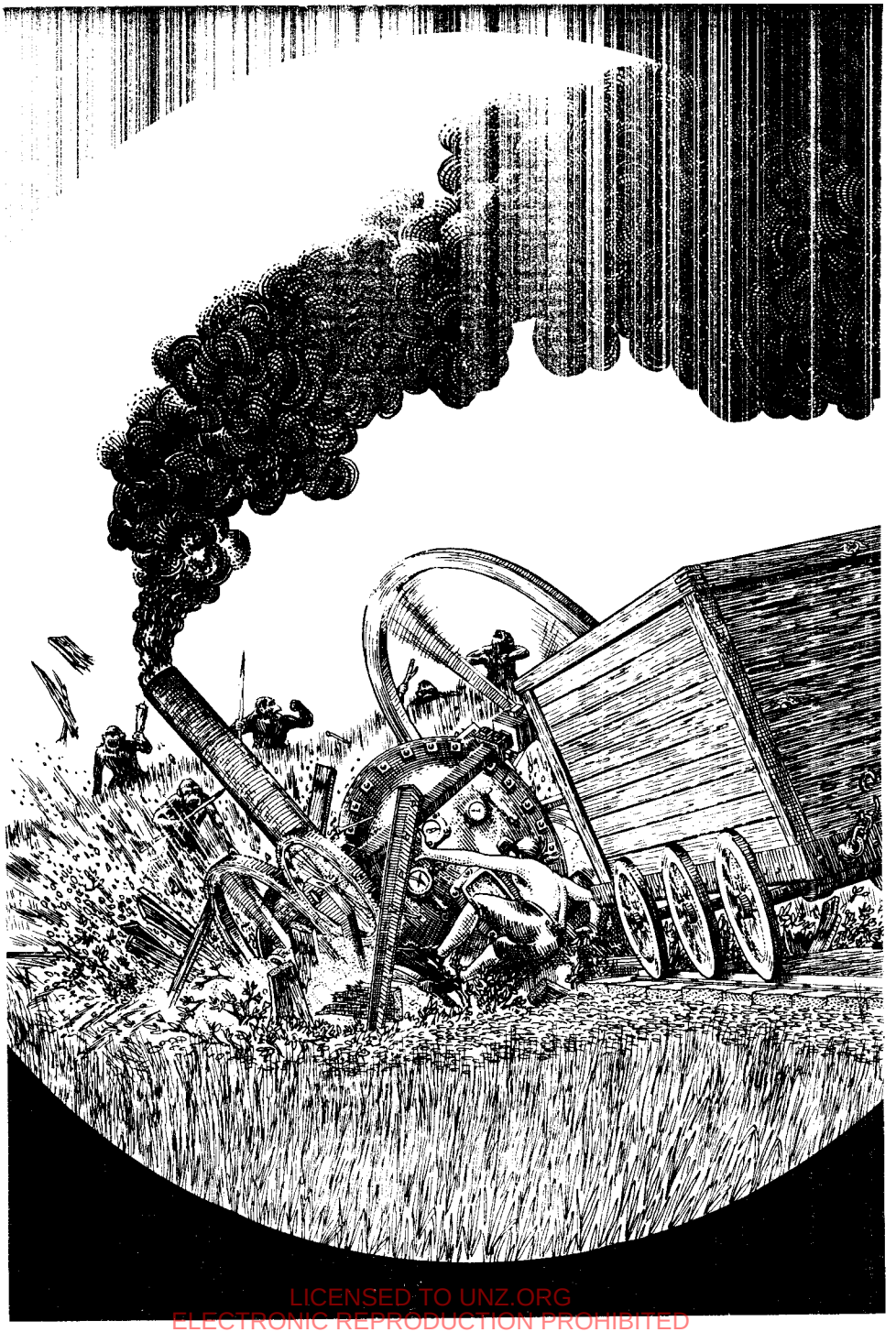

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Prem Chand told Paul Tilak. Prem Chand was already unbuckling the thick leather straps that linked Caesar to Hannibal. He stood up on his elephant's back, called to the train crew, "Grab your rifles and climb onto the two beasts. It is a rescue now!"

The brakemen scrambled down from their waggons and rushed forward. Hairy elephants were better haulers than carriers; Caesar and Hannibal could only bear five men apiece. As he had at the Springfield station, Prem Chand made Caesar lift a foreleg to serve as a step. "You, you, you, and you," he said, pointing at the first four men to reach him. They swarmed onto the elephant.

Just behind him, Tilak was making a similar chant. Hannibal trumpeted at taking on unfamiliar passengers, but subsided when Tilak thwacked his broad head with the elephant-goad.

"Follow us as closely as you can," Prem Chand told the disappointed latecomers from the back of the train. Then he dug his toe in behind Caesar's ear. "*Mall-mall!*" he shouted—forward!

Even with the burden it was carrying, the hairy elephant shot ahead, as if relieved to be free of the burden of the train. Its gait shifted from its usual walk to a pounding rack, with hind- and foreleg on each side of its body advancing together.

Most of the brakemen had ridden an elephant before, but not under circumstances like these. They clutched at Caesar's harness to keep from being pitched off. In spite of everything, one did fall. He rolled away, clutching his ankle. The hairy elephant's left hind foot missed his head by inches.

They were a bit more than half a mile from the Iron Elephant, three or four minutes at the elephants' best pace, which they were certainly making. When they had covered about half the distance, Prem Chand told one brakeman, "You shoot."

"No chance to hit at this range," the fellow protested.

"Yes, but we will remind the sims we are coming, and you will be able to reload by the time we get there."

"Never tried reloading on top of an elephant before," the brakeman said darkly, but he raised the rifle to his shoulder and fired. Caesar trumpeted in surprise. So did Hannibal, a moment later.

Some of the subhumans had already started to break and run—two carried a man's corpse between them, while another fled with a body slung over its shoulder. But others will still fighting, and one stubbornly kept trying to shove a spear into the metal side of the trapped steam engine. Prem Chand had to stop himself from giggling: Paul Tilak had certainly been right, there.

Against men, even men carrying firearms, the sims might have kept up the battle, at least for a little while. But the hairy elephants were the most fearsome beasts on the plains. The sight of two bearing down like an angry avalanche was too much for the subhumans. They took to their heels, hooting in dismay.

The last to run off was the one that had tried to slay the Iron Elephant. Baring its teeth in a furious grimace, it hurled a sharp stone at Caesar before seeking to get away. The rock fell far short, but by then the sim was in easy rifle range. Prem Chand's bullet sent it sprawling forward on its face.

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He felt more like a general than an elephant driver. With gestures and shouted commands, he sent Hannibal and the men he thought of as his foot-soldiers after the retreating sims. He walked Caesar up to the head of the rival train.

The brakeman to the contrary, reloading on elephantback was possible—but then, Prem Chand had more practice at it than the brakeman did, too. He fired at a sim. To his disgust, he missed. Many sims were down now, either dead or under cover in hollows the tall grass concealed.

The railroad men moved up cautiously. A couple went ahead to reclaim a body the sims had dropped in their flight. Prem Chand was dismayed to see no sign of the corpse the pair of sims had been carrying; the subhumans who survived this raid, curse them, would not go altogether hungry.

The elephant driver wondered if the body was Trevithick's. He had yet to spot the steam-engine man, and he was close to the upended Iron Elephant. After digging their pit under the rails, the sims had covered it with branches and then covered them over with dirt and gravel so they looked like the rest of the roadbed. Prem Chand shivered. He might well have led Caesar straight into the trap.

He got down from the hairy elephant, walked over to the hole in the ground. The rails had buckled as they tried and failed to support the Iron Elephant. It was tilted at a steep angle, almost nose-down in the pitfall. A real elephant, which did not carry its weight on the rails, would have taken a worse fall.

A dead sim lay half in, half out of the pit. Prem Chand looked down into it. "Hello, Prem, very good to see you indeed," Richard Trevithick said. He held a pistol club-fashion in his bandaged left hand; his right arm hung limply. "I'm afraid you'll have to help me out of here. I think I broke it. Oh, and congratulations—you seem to have won the race."

"I had not even thought of that," Prem Chand said, blinking. He turned to his crew. "Get me a length of rope. Tie one end to Caesar's harness and toss the other down to me." He slid into the pit.

In India, he thought, hazily remembering his grandfather's stories, there would have been sharpened stakes sticking up from the bottom. Luckily, the sims had not thought of that.

He got to his feet, brushed off himself and Trevithick. "You shot the sim up there?"

The engine handler nodded. "Yes, and then spent the rest of the fight hiding under the Iron Elephant, while another of the creatures tried to kill it." He laughed ruefully. "Not very glorious, I'm afraid. But then, neither was falling out of the cab when the engine went down. If I hadn't been leaning back for another shovelful of coal, I never would have got this." He tried to move his arm, winced, and thought better of it.

"But you would have been out in the open, then, and the second sim might have speared you instead of your machine," Prem Chand pointed out.

"Something to that, I suppose."

A rope snaked into the hole. Prem Chand tied it around Trevithick's body under his arms. "Is it hooked up to Caesar?" he called.

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"Sure is," a brakeman answered.

"Good. *Mall-mall!*"

The rope went taut. Prem Chand helped Trevithick scramble up the sloping side of the pit while the elephant pulled him out. The engine handler yelped once, then set his teeth and bore the jouncing in grim silence. Prem Chand yelled "*Choro!*" as soon as Trevithick was out, then crawled slowly after him.

"You didn't need to get us clean the first time," Trevithick remarked.

"You are quite right. My apologies. I will dirty you again, if you like," Prem Chand said, deadpan.

Trevithick's expression was half grin, half grimace. Then he looked around, and dismay replaced them both. Down in the pit, he had not been able to see the fight that had raged up and down the length of his train. Most of the bodies spilled on the ground, most of the blood splashed on waggons and grass, belonged to sims—but not all.

"Oh, the poor lads," the engine handler exclaimed.

Some of the survivors of his crew had joined Prem Chand's men in pursuit of the sims, which made his losses appear at first even worse than they were. But Trevithick, pointing with his left hand, counted four bodies, and one of his brakemen added, "Pat Bailey and One-eye Jim is dead, but we can't find 'em nowheres."

"Filthy creatures," Trevithick muttered.

Prem Chand knew he was not talking about the missing men. Trying to give what consolation he could, he said, "This sort of thing will not happen hereabouts much longer. Soon this part of the country will be too thickly settled for wild sim bands big enough to attack a train to flourish."

"Yes, of course—that's been happening for the past hundred fifty years, since men came to Virginia and Plymouth. It doesn't do me much good at the moment, however—and even less for One-eye Jim and Patrick Bailey."

Prem Chand had no good answer to that. He led Trevithick over to Paul Tilak, who knew enough first aid to splint a broken arm. Ignoring a man's howls, Tilak was washing a bleeding bite with whiskey. "Don't be a fool," he told the fellow. "Do you want it to fester?"

"Couldn't hurt more'n what you just done," the man said sullenly.

"That only shows how little you know," Tilak snorted. He moved on to a brakeman with a torn shirt and blood running down his chest. "You are very lucky—that spear could as easily have gone in as sliding along your ribs." He soaked his rag at the mouth of the whiskey bottle. The brakeman flinched.

"There's one attention I won't regret being spared," Trevithick said, waiting for Tilak to get round to him.

"I do not doubt that." Prem Chand's eyes slipped back to the Iron Elephant. "Richard, may I ask what you will do next?"

The engine handler followed his rival's glance. "I expect we'll be able to salvage it, Prem, with the help of your elephants. The damage shouldn't be anything past repair." His face lit with enthusiasm. "And back in Boston, my brother is working on another engine, twice as powerful as the Iron Elephant.

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If I'd had that one here, you never could have stayed close to me!"

"In which case, you and your crew probably would all be dead now," Prem Chand said tartly.

But in spite of his sharp comeback, he felt a hollowness inside him, for he saw that the future belonged to Trevithick. As surely as men displaced sims, steam engines were going to replace hairy elephants: it was much easier to make an engine bigger and stronger and faster than it was an elephant. A way of life was ending.

He let out a long sigh.

Trevithick understood him perfectly. "I told you once, Prem, it won't be so bad. There will always be railroads, no matter what pulls the trains."

"It will not be the same."

"What is, ever?"

"He has you there, Prem," Tilak put in.

"Maybe so, maybe so," Prem Chand said. "Our grandfathers, who sailed halfway round the world to come here, would have agreed with you, I am certain. But do you know what hurts worst of all?"

Trevithick and Tilak shook their heads.

"When that second engine comes into Springfield, I am going to have to admit George Stephenson is right!" ■

IN TIMES TO COME

● A couple of years ago Timothy Zahn won a Hugo for his *Analog* novella "Cascade Point." In case you missed that, or don't remember it too well, it introduced a highly original form of interstellar travel that had reached the state of engineering usefulness considerably before it was fully understood theoretically. In particular, it had a strange side effect of largely unknown origin: people experiencing a transition with this method saw multiple images of themselves, no two quite alike. The effect *might* be purely psychological, but there were good reasons to suspect the cascade point images actually showed the status of their subject in several possible alternate realities. So what do you do if one of your images suddenly vanishes? It may well mean, under certain circumstances, that a ship you almost took is in trouble and needs help. But is "The Evidence of Things Not Seen" strong enough evidence to justify the expense and inconvenience of a rescue attempt? That, in highly capsulized form, is the dilemma Captain Pall Durriken faces in next month's cover story.

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The Alternate View

NEUTRINOS AND WIMPS

John G. Cramer

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This AV column is about more "troglodyte physics," in this case for the detection of neutrinos. Deep underground in the Homestake Gold Mine. 4,850 feet below Lead, South Dakota, is a giant 100,000 gallon tank of perchloroethylene, a cleaning solvent made for use by commercial dry cleaners. But this cleaning fluid has been given another mission than removing stains from dresses and sport coats. Since 1968 it has been used in a massive effort to measure the temperature at the heart of the sun: it is a detector of solar neutrinos. Two decades ago Dr. Raymond Davis of Brookhaven National Laboratory set up this apparatus to detect the neutrinos emitted by one of the nuclear fusion reactions which are the sun's power source.

The neutrino is the massless and electrically neutral weak-interaction partner of the electron, always traveling at the speed of light and rarely interacting with anything. The sun makes *lots* of neutrinos. About 61,000,000,000 neutrinos per second from the sun pass through each square centimeter of cross section on the surface of the Earth. If your body presents an area to the sun of 10,000 square centimeters, this means that 610 trillion neutrinos are passing right through your body in the second it takes to read this line. But you don't notice this: neutrinos can pass through light years of lead without impediment. They pass through your body and through the Earth as if neither was there. As you might imagine, this makes the detection of neutrinos very difficult . . . but not impossible.

Because neutrinos have such a low probability of interacting with matter, detecting them requires a scale of physics experiments which can best be described as Heroic. Davis detects neutrinos by collecting, every month or so, the few atoms of radioactive argon-37 gas which are produced when neutrinos from the sun interact with the 10^{31} or so chlorine atoms in his cleaning fluid. And over the years he has found that he can account for only about ⅓ of the number of neutrinos that should be present according to our best present understanding of how nuclear fusion reactions work in the interior of the sun.

When Davis's results first began to emerge about a decade ago there was furious experimental and theoretical activity to check all of the aspects of solar astrophysics to see if the factor of ⅓ discrepancy could be explained. The astrophysical modeling of the sun was carefully re-examined in every detail. New experimental tests of the nuclear physics underpinnings of the solar models were made, but produced no explanation of the dearth of neutrinos. There have also been a number of explanations given which might be characterized as far-out. Examples of these are the suggestion that neutrinos oscillate from one

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state to another as they travel from the sun's interior to the Earth, or that the sun has an inert iron core, or that the fusion reactions in the sun may have actually stopped, leaving the sun to run on its left-over heat. But so far, no consistent and satisfactory explanation has been given. Davis's low neutrino count today remains an unsolved mystery.

In this AV column I want to describe some new techniques for detecting neutrinos from the sun. Then we'll end with a new idea which may explain both the solar neutrino problem and the Dark Matter problem (see "The Dark Side of the Force of Gravity," my AV column of February 1985).

The next operating detector of solar neutrinos is going to be very big and very expensive. It's likely to be made of gallium, the 31st element in the periodic table. Gallium is a metal with a very low melting temperature. If you held a cube of it in your hand, it would melt into a mercury-like puddle. It's used to make the red LED indicator lights used in many electronic devices. And in a few years the semiconductor gallium arsenide may provide the basis for the next revolution in high-speed transistor electronics.

Gallium will probably be used for neutrino detection because the isotope gallium-71 (31 protons and 40 neutrons) is converted to germanium-71 (32 protons and 39 neutrons) by solar neutrinos. This conversion process is sensitive to neutrinos of much lower energies than those detected by the Davis experiment. A large quantity of gallium would be placed in chemical solution in eighteen glass-lined 750 gallon tanks located deep underground, perhaps in the Homestake Mine. Radiochemical processing would recover and identify the germanium-71 made by solar neutrinos over the course of months and years. The measurement would give an independent check on whether our understanding of how the sun works is really incomplete.

But there is a problem. Gallium is a *very* expensive material, and there's not too much of it around. The gallium neutrino detector which has been designed needs 30 tons of the stuff, a good slice of the world supply worth more than $5,000,000. The operating cost of the experiment would be a comparable sum. Perhaps if the gallium were sold at the end of the experiment some of these costs (or more) could be recovered, but that's not the way the funding of scientific experiments is figured. And $10 million is a large enough chunk of cash to dent the budgets of scientific funding agencies like the National Science Foundation and the Department of Energy. After gasping at the cost of this experiment for a number of years, the scientific community now seems to have arrived at the conclusion that the gallium neutrino experiment really is necessary and should be done soon. It is expected to start up in the next year or so.

But 30 tons of gallium! Surely there must be a better way to detect neutrinos. And perhaps there is. The semiconductor material silicon in its single crystal form at low temperatures has a very unusual property. A small amount of energy introduced into the crystal results in a large change in temperature. Recently, this characteristic of silicon has been used in the detection of X-rays with a technique called "bolometry" or

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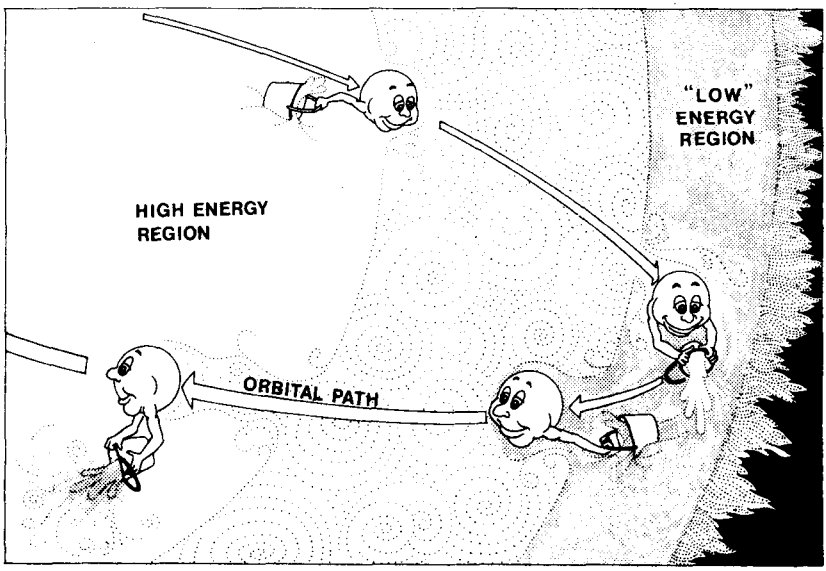
energy measurement. A silicon cyrstal is cooled down to within a few thousandths of a degree of absolute zero. An X-ray stopped in this crystal deposits its energy and the accompanying temperature rise is registered by sensitive thermometers attached to the silicon cyrstal surface. The observed signal shows a tiny temperature rise for a few thousandths of a second before the cooling system restores the temperature to its former value. The technique should work equally well with neutrinos from the sun, which typically carry ten or more times as much energy as the X-rays which have already been detected with this technique.

Calculations show that, given an interaction, detection of neutrinos by this bolometric technique should be quite easy. The severe problem is, of course, to use enough silicon to give a reasonable probability of having a neutrino interaction in the first place. This requires a large amount of silicon (up to 10 tons), somewhat less of a cheaper and more abundant material than the 30 tons of gallium mentioned above. The silicon bolometric technique looks very promising. And it offers direction sensitivity, energy resolution, and other advantages which we do not have the space to discuss here. But the technical design of the experiment will require several more years of hard work by a team of physicists before actual measurements can begin. So keep your fingers crossed. . . .

Finally, I want to mention WIMPs. That perhaps misleading acronym stands for *W*eakly *I*nteracting *M*assive *P*articles. As I have mentioned in past AV columns, various presently fashionable theories of fundamental particles, particularly grand unification (GUTs) and super-symmetry (SuSy) theories, have



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predicted a veritable bestiary of peculiar particles, none of which anyone has yet observed. There are squarks and winos, gluinos and higgsinos, selectrons, sneutrinos and photinos. These could-be particles have only one property that interests us at present: *mass*. The suggestion of some of these particle theories is that the lightest of these exotic particles could possibly still be around as remnants of the Big Bang. They should have a mass perhaps on the order of a proton mass but should not have strong or electromagnetic interactions with more normal matter. Thus this type of object is a weakly interacting (in the generic sense) and massive particle: in a word, it's a WIMP.

My February 1985 AV column on Dark Matter discussed the possibility that axions, hypothetical particles of very small mass, are responsible for most of the mass of the universe. WIMPs are a more massive alternative to the axions which could provide an explanation for exactly the same puzzles: the high velocities of stars in galactic haloes, the synthesis of helium and lithium in the Big Bang, the formation of galaxies, and the requirement of the new inflationary scenario of the Big Bang that the universe must have exactly enough mass to be "critical" and 300 times more than we can easily account for.

But it has been recently realized that, unlike axions, WIMPs can also provide the solution to another puzzle, the solar neutrino problem discussed above. Theorists at the University of California at Santa Cruz and at Harvard have shown that WIMPs can reduce the number of solar neutrinos detected by the Davis experiment. The scenario goes like this. Heavy WIMPs tend to be collected by the sun's very strong gravitational field and to move freely through the sun's volume, passing repeatedly through the central region and occasionally interacting with the normal matter of the sun by scattering. The solar model prediction of the number of neutrinos detected by the Davis experiment tells us that only the central 5% of the sun's volume, the region with the very highest temperature, produces 70% of the especially energetic neutrinos detected by Davis, but contributes only 10% to the total energy output of the sun.

But WIMPs could act as a rather good thermal conductor, carrying heat from the sun's center to other locations by their infrequent scatterings. The effect of this would be to reduce the temperature at the sun's center while raising it slightly elsewhere. This can reduce the production of the most energetic neutrinos from the sun without markedly reducing the sun's total energy production.

There are some problems with this picture which must be worked out, but it does seem to provide a plausible way of dealing with the solar neutrino problem and the dark matter problem at a stroke. Moreover, it has the decided advantage of being testable. The modeling of the sun with WIMPs included would predict a reduced number of the energetic neutrinos detected by Davis's chlorine experiment, but no diminishing of the number which should be detected by the proposed gallium detector or the silicon bolometer described above. Therefore, the ratio of high energy neu-

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trinos to medium and low energy neutrinos is a very valuable measure of the validity of the WIMP explanation, and this parameter should become available when the results of the new neutrino experiments become available. We may confirm these ideas, or we may find the need for new ones. But in any case, we will be probing the very heart of the sun to learn how this most supremely important of all energy sources works. We will learn the secrets of the sun itself. ■

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ON GAMING

(continued from page 105)

game also makes a limited use of paragraphs to provide character background and interesting raid results.

The Kobayashi Maru is a game version of the famous 'no win' scenario that tripped up Saavik in *Star Trek III*. This is the revised version, the 'slightly possible to win' scenario. The player controls the Enterprise and its crew as it enters the Neutral Zone searching for the stranded freighter, Kobayashi Maru. The map board includes a clever 4-tiered display of the Neutral Zone and a place to record current crew status and which systems are powered.

The Enterprise takes readings of hidden counters as it moves through the Zone. These may be everything from Klingon beacons to Gravitic mines. If lucky, a Kobayashi buoy will be found and the Enterprise can move up one tier, and closer to the vessel. Power has to be alloted very carefully. Too little, and a surprise Klingon attack will leave the Enterprise destroyed. Too much, and the Enterprise's illegal presence will be detected. The game features a unique combat system that uses an intriguing tactical chart. This game can be a tease. You can get so close to winning, then have every Klingon vessel in the area head right toward you.

Free Enterprise is a trading game where a player's investment in snoutsilks or frofnobles determines whether the inhabitants of the Glisten Cluster join the Federation or the Klingons. Since trading prowess is highly valued among the Glista, the winner will be whoever accumulates the most megabobs (the Glista currency). If the Klingons should accumulate 100 megabobs, the Federation player automatically loses.

Unfortunately, each planet in the Cluster is subject to 'fad changes' and yesterday's popular thrint-whistles may be replaced by some puce colored gleebers. While combat with the Klingons is a possibility, just getting the right goods to the right planet before the fad changes will be demanding enough.

Any of of these board games is good enough to stand alone. They represent state-of-the-art in solitaire boardgames. The combined efforts of designers Greg Costikyan, Douglas Kaufman, and John M. Ford should keep everyone gainfully occupied while awaiting the inevitable *Star Trek IV*. ■

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Spider Robinson

THE MICK OF TIME

This is, in a real and special sense, the *ultimate* Callahan's Bar story . . .

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New Year's Eve at Callahan's Place, and I was feeling about as much contentment as an unmarried man can know, thinking of how many New Year's Eves I'd spent in this warm, well-lit, cozy room with the best friends I'd ever known, thinking happily of how many more there would be to come. You'd think that would have warned me.

Somehow or other the conversation had turned to Conundra—the kind of questions that are good for keeping you entertained on an insomniac night, and not a whole lot else. They're sort of like test programs for the mind, and I guess New Year's Eve is a natural time for such things.

It was early on, not gone eight o'clock and only a handful of the regulars in attendance yet. Tommy Janssen had asked Long-Drink McGonnigle something, I forget what, and the Drink replied something along the lines of, "Son, that's one of those great Questions That Will Never Be Answered."

Doc Webster snorted. "Flapdoodle. Any meaningful question can be answered—and will be, sooner or later. Questions just never go away until they are."

Callahan finished reloading the coffeepot and came over to join us. "Doc," he rumbled, "if any question can be answered, maybe you can help me with one that's been occupyin' my mind for a long time now. How many angels can dance on the head of a beer?" There was a general giggle.

"I said, 'meaningful questions,' " the Doc replied. "Your question has no meaning because one of its crucial terms is undefined. Tell me—specifically —what you mean by an 'angel,' and I'll answer your question. Or rather, you'll have answered it yourself."

"Aw hell, Doc," Long-Drink said, "you know what an angel is."

"If I did, I wouldn't be paying alimony. My point is, it's easy to make up questions that don't have answers because they don't really ask anything. Can God make a rock so big He can't lift it? Where was Moses when the lights went out?"

"We're certainly into a theological vein here," said Tom Hauptmann, the former minister. "There's one that's always puzzled me, Doc, and I think it has meaning. Water is a clear, colorless fluid. So how come when you splash it on a towel, the towel gets darker?"

The Doc was silent for a moment, chewing on that, and Tommy and Long-Drink began to chuckle. "There's an answer," the Doc insisted. "I never said I knew all the answers—but if the question has meaning, the answer is knowable."

I thought of one that's kept my own mind harmlessly occupied for hours at a time. "Hey Doc, I've got one. A thought-experiment, and a humdinger: it's one of those that causes a system-crash in the brain. The beauty of it is that one day soon it will be possible to try it out in the real world and *see* what the answer is—but right now, even though all the components of the question are meaningful and known, I'll bet a case of Anchor Steam Beer nobody here can come up with an answer and prove it."

"Hey," Susie Maser (Slippery Joe's senior wife) said, "for a case of all-barley beer, I'll take on Zeno's Paradox

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with one hand tied halfway behind my back. Whip it out, Jake.'' Several others leaned forward attentively.

''I've put this question to about thirty scientists in ten different disciplines,'' I said, ''and to educators, and science fiction writers and editors I met at conventions, and the funny thing is that they all reacted the exact same way. I'd lay out the question, and they'd all start to answer right away . . . and then they'd catch themselves, and fall silent, and get a far look . . . and a minute or so later, they'd change the subject.''

''Come on, come on,'' the Drink said. ''Lay it on us.''

''You're right,'' I said mournfully. ''I'm taking too long to get to it. A man'll do that sometimes, when he's dehydrated—''

Long-Drink sighed and reached into his pants pocket. ''Give the bastard a beer, Mike.''

''Okay,'' I said when I'd blown the foam off and taken a sip, ''this experiment could actually be done in sloppy form right now—but it purifies it a great deal if we imagine it taking place in space, in a microgravity environment. Let's say that somewhere up in orbit, there's a perfectly spherical object whose inner surface is mirrored: a spherical mirror, all right? Naturally, it's dark in there. Floating with his eyes at dead center is an astronaut—never mind how he got in there,'' I said hastily as Susie began to object. ''Maybe the mirror was blown around him; anyway, he's there. He's scared of the dark, so he takes a flashlight out of his pocket and turns it on. *What does he see?*''

Everyone in the room started to answer at once—

''Well, he—''

''The back of—''

''All of him at—''

''Nothing but pure white—''

—and then they all caught themselves. And fell silent. And got a far look.

After about ten seconds, Susie started to open her mouth. ''Does it make any difference,'' I asked, ''which way he points the flashlight? How would what he sees change if he pointed the thing at himself? Or if he put it in his mouth and made Monster-Cheeks?'' and Susie closed her mouth again.

When the silence had lasted for nearly a minute, Doc Webster said, ''Another classic question I've always wanted to know the answer to is how and why evolution designed the human taste-buds to love a poison like sugar.''

I looked questioningly at Callahan, and he nodded. ''Subject change,'' he agreed. ''Appears to me that these birds owe you a case of Anchor Steam, Jake.'' He counted heads. ''I make it a beer apiece; ante up, folks.''

Grumbling, everybody reached into their pockets, but they brightened up considerably when Mike handed across my case and I started passing out the beers.

About that time Mick and Mary Finn came in, by the wrought-iron staircase from the roof. (Finn could just as easily have landed on the ground, of course; the parking lot was still empty enough to make an excellent LZ—but he's had a sentimental attachment to that roof ever since the night he met his wife up there, and to the staircase since he married her on it, and he always comes in that way now.) There was a time when

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if Mickey came in in the middle of a conversation, it had to sort of pause for a few minutes while we all helped him work his way into it. But marriage has, among the many other ways it's been good for the big alien, tended to humanize him a little, to make it easier for him to plug into things smoothly.

"Well, what do you know, it's a sawbuck!" I called out, and did not have to patiently explain to Finn that a sawbuck is two fins; he either got it or let it go. "Howdy folks. Welcome to the feast of reason. The topic is Ponderable Questions—and the fine line between them and the imponderables. You two got any good ones?" I gave him a beer, and then I gave his wife a beer, and I don't even know why I bother mentioning that Mary smiled when I gave it to her, because the smile didn't do anything more than flay the skin off my body, sandblast every nerve and ligament, Osterize a few major organs and fry my eyeballs in their own grease; I made no visible sign that could possibly have been detected by anyone except the people present in the room. I'm over her completely.

"Certainly," Mickey said. "The more I live with humans, the more questions I have, and the more imponderable they become. Mary is better than any human I have ever known at explaining them —even better than you, Michael," he said to Callahan, "—but even she has no more than a sixty percent success rate."

"Ah, now we've hit pay-dirt," Doc Webster said. "What does an intelligent non-human think of the human race? We're such vain creatures it's one of the most fascinating questions we can imagine—spawned thousands of myths and books and movies."

"Well, naturally," Long-Drink agreed. "Man alone cannot know himself. The container can't contain itself."

Mickey Finn looked politely puzzled. "I do not understand what you mean. Do not all containers contain themselves? If not, what does contain them?"

The Drink got another far look. Finally the Doc said, "What puzzles you the most about humans, Mick? Politics? Sexual customs? Art? Philosophy?"

"Bathrooms," the big alien said at once.

"Jump *back*," Long-Drink said incredulously.

"I am serious, Drink my friend," Finn told him. "I don't understand why *humans* are not puzzled by their bathrooms. I have wondered about this since before I quit working for the Cockroaches. I understand the concept of a blind spot, but it is hard to comprehend one of this size."

"There's usually something substantial kinda blocking the view in that direction, Mickey," Callahan said dryly. "What exactly is it that puzzles you about bathrooms?"

"Everything, Michael. The first item one finds in a typical bathroom is the sink. I have made tests: half of the time and energy spent at a sink are used in adjusting water temperature. Your technology makes cheaply available thermocouples which will reliably deliver water of any specified temperature—yet in every single bathroom in the world the job is done by hand, with every use. Unbelievable waste of time and water and heated water.

"Next the medicine cabinet: I have

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never seen one designed with the intelligence of the average spice rack. You *have* to spill everything into the sink to access the aspirins.

"The human bathtub could only have been invented to help weed out the elderly, careless, and unlucky; it could be argued that this is laudable, but why must even the survivors be made so *uncomfortable* during what ought to be a delightful chore? Why are comfortable head supports not standard; why must tubs always be too short, too narrow, too hard, and too difficult to keep clean; why build them of such preposterous materials; and above all, why is the single shower-head almost invariably located where it cannot be brought to bear on the specific areas where it would be most useful and most pleasant?

"As for the commode . . . it would take a volume simply to list its gross deficiencies. Forget the insanity of throwing precious fecal matter into the ocean, along with gallons-per-bolus of drinking water—how could humans possibly have designed for daily use and accepted as a universal standard an artifact which is acutely physically painful to use, enforces an unnatural and inefficient posture, and has no facilities whatsoever for cleansing either its user or itself? And why do you persist in using them for male urinals though they are manifestly unsuitable for that purpose?

"To be fair, I must admit that given your level of technology there is not much to criticize in the towel rack—but my friends, from an engineering point of view it is the only pardonable object in a human bathroom."

Well, a few of us said a few things, but there's no sense kidding; Finn had us cold. It seemed strange that these things had never occurred to any of us before. Of course, we took bathrooms for granted, we'd grown up with them, but still . . .

About that time the door opened and a crisp breeze blew two men into the room, there was a glad shout as we recognized them.

"By all the Saints in Leslie Charteris's bookshelf," boomed Callahan, "if it ain't the MacDonald Brothers! About time you two bums showed up here. It's been too damn many years."

After a short merry interval of backslaps and handshakes and let-me-get-your-coats we got Jim and Paul seated at the bar with God's Blessings in front of them. "God, it's good to be back here," they chorused, and then Jim took over the vocalizing for both of them. "I make it three years," he said to Callahan, and, "Yes, Jake, two years ago, and yes it is," to me, and "Upstate in Plattsburgh—and it's getting pretty sane there," to Long-Drink, and "Perfect, thanks; we're learning some things about repairing ourselves," to Doc Webster, and, "No, Eddie—we don't need one," to Fast Eddie, and, "No, Reverend, and don't think we haven't tried," to Tom Hauptmann, and then, to all of us: "We're sorry, we ought to let you vocalize the questions so you can all share the answers—but there were so many in the first round that we wanted to save a little time."

Jim and Paul are telepaths, you see.*

*see "Two Heads Are Better Than One," in CALLAHAN'S CROSSTIME SALOON (Berkley)

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What I'd been wondering was if they'd finished getting certified as psychiatrists yet, and if so whether it was working out the way they'd hoped. Some of the others' questions I could puzzle out. Callahan had been wondering how long it'd been since their last visit; the Drink was going to ask where they were practicing; the Doc was going to ask after their health. Eddie's and Tom's questions eluded me.

"Hello, Mary," Jim went on, "it's good to meet you too. God, what a lovely marriage you two have! No, really? But that's *wonderful!* Don't worry, we wouldn't dream of it. Thanks. Finn, that's really fascinating stuff about the human bathroom. Do you see a pattern? Do the rest of you?" I'd been thinking of filling Jim and Paul in on the conversation that'd been in progress when they arrived, and of course they were a step ahead of me. "Consider: the same inherent stupidity Finn points out can be found in the typical kitchen. Fridges that spill money on the floor when you access them; stoves and ovens that spill money on the ceiling; a heat-maker and a heat-waster side by side, unconnected; sinks with the same problems he mentioned and others; waste-management techniques that belong in the Stone Age.

"In the typical bedroom you'll find just as much inexplicable thoughtlessness. It's only in the last year or two that anyone even thought of adapting hospital-bed technology to home beds. The three rooms all people *must* spend time in every day, none of them rationally designed. Yet in the den you'll probably find a computer that's a masterpiece of skullsweat and micromachining, and overhead there are satellites beeping in high orbit and footprints on the Moon. Right now Paul and I are planning to spend over a thousand dollars on a hard-disk drive for our Macintosh, because it drives us crazy having to wait more than seven seconds to boot in, and it never occurred to either of us to spend fifty dollars on a thermocouple to save us hours a week of adjusting hot and cold water taps. Humans seem to have the idea that it's okay to devote thought and money and energy to our jobs, but not to our selves."

He paused courteously to let Doc Webster say aloud, "I don't know; we indulge ourselves pretty good in some ways. They make some pretty fancy entertainment gear, stereo and video and computer games and so forth."

"Nothing near as fancy as the stuff people use for work. In our Mac Buyer's Guide, business applications programs outnumber games software ten or twenty to one. All the stuff you mention was used for work for years before they made home consumer versions. And you can't sit in anything *near* as comfortable as a dentist's chair to enjoy them all. Hold-over of the Puritan ethic: work can be noble, but the self is not worth attention. Considering that useful work is getting harder to come by, it's an attitude we're going to have to change eventually."

"I dunno," Doc Webster said. "I think we put in plenty of time on enjoyin' ourselves; maybe too much."

"Maybe. But I think we enjoy ourselves in inappropriate ways, at inappropriate times, to inappropriate degrees, just *because* we're so unused to doing it, so uncomfortable with wanting to,

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so reluctant to put thought into it. Paul and I find that most of our patients don't love themselves enough, so they treat themselves so badly it's hard for them to love themselves enough—it can be a literally vicious circle."

Finn glanced at Mary on that one, and she smiled fondly. "See, kid? It's not just a human problem, is it?" He smiled sheepishly back. "Don't worry, you're making progress." She turned back to the MacDonald brothers. "I'm glad to meet you fellows, and you've got a mighty insight going there, which come to think of it is no surprise, but . . . *can we tell it now?* You know I'm dying to."

Jim and Paul both smiled, and this time it was Paul who did their talking. "Of course, dear. I don't know how you've held it in this long. Go ahead."

She turned to the rest of us. "You folks know what's been keeping Mick awake nights since he got to this planet, right?"

"Sure," Tommy Janssen said. "Same thing that keeps a lot of us human type beings awake nights too."

"And I don't know about the rest of you," the Doc insisted on saying, "but Armageddon awful tired of it."

Mary ignored him magnificently. "That's right: nuclear holocaust. It wouldn't bother him any, physically, of course—and by the way, it wouldn't bother me or any of you physically either. You know how raindrops ignore friends of Mick's? Well, ionizing radiation and blast forces behave the same way, now." She reached over the bar, took out Callahan's riot-baton, and brought it down on my head as hard as she could. A microinstant after it struck, the top of my head turned hard as titanium alloy.

"That's fantastic," I said as soon as I could get my breath. "I felt a little sting, as though you slapped me with your open palm."

"That's the most pain you'd feel even if I shot you with Pop's 12-gauge," she said, grinning broadly. "However you die, Jake, it won't be by violence. But that's beside the point. Nuclear devastation would be a sad thing even for us who survived. We'd miss the rest of the human race—"

"Speak for yourself," the Doc interjected.

"—and as for Mick, without a high-tech civilization, he'd die in a few hundred years for lack of maintenance. So he and I have been working on the problem ever since we got married, kind of putting our heads together, and the reason we came here tonight is—"

"To kick around some ideas, sure," Tommy said. "Great. As long as we're all brainstorming the Unanswerable Questions, we might as well tackle the Big One."

"Well, no, actually," Mary said. "I mean, we'd be glad to kick around ideas on some other topics with you later, if you like. But this one we've sort of . . . uh . . . solved."

"WHAT?"

I let go of my drink; Long-Drink started so sharply his watchman's cap flew from his head; Tommy spit a cigarette across the room; Fast Eddie the piano player had what musicians call a "train wreck"; the Doc was caught without a wisecrack of any kind; and Callahan—imperturbable Callahan—poured coffee on his hand and let out

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a bellow. It is worth mentioning that my drink didn't go anywhere, the Drink's cap returned to its perch, Tommy's cigarette landed in wet sawdust and extinguished itself, and the Doc's flabby old heart did not stop. Oddly the coffee did scald Callahan's wrist. The MacDonald Brothers were grinning a mile a minute, and even Finn had a happy expression pasted on his long gaunt face. Mary looked more embarrassed than anything else, like someone who's solved the whole crossword in two minutes and spoiled everyone's fun. *Jake*, I thought to myself, taking hold of my glass again, *you sure can pick 'em*. It seemed astonishing that I had ever thought myself this woman's equal, imagined us living together . . . (It's stupid to be jealous of someone with Mickey Finn's unique advantages, especially when he's such a good friend. But I had learned lately that I'm easily that stupid).

None of us doubted her for a moment, of course. In the first place this was Callahan's Bar, where *anything* can happen —and frequently does; in the second place, she was Mike Callahan's daughter, and therefore capable of anything she put her mind to; in the last place, she was Finn's wife. Me, I gave up using the word "impossible" after the time I watched Fast Eddie win a large bet by successfully skiing through a revolving door. If Mary Callahan Finn said nuclear war wasn't a problem any more, then it was time to start converting my fallout shelter back into a root cellar again, that was all . . .

The tone of Callahan's voice, now there was something genuinely startling. "Darlin'," he said darkly, "I would like to know, if you wouldn't mind telling me, exactly *how* you and Mick solved this little problem."

"No, Mike, no," Jim or Paul hastened to assure him. "Nothing like that."

Mary apparently knew her old man well enough to read him as well as two professional telepaths. "You ought to know me better than that, Pop. No—to answer your question out loud for everyone else's benefit—we did *not* solve the problem of nuclear war by making any changes in human nature. I'm not saying Mick couldn't pull it off if he tried, with enough lead time, but he wouldn't. Besides, I wouldn't let him. The very aggressiveness that makes the human race dangerous to itself is what's going to take us to the stars one of these days—you couldn't filter it out without changing humanity for the worse, maybe destroying it."

"My own race lacked that sort of aggressiveness," Finn put in. "I am its last living member, and it has not escaped me that there may be a connection. I am more advanced, more knowledgable than any of you—and even I am not competent to alter a psyche, individual or collective, Michael."

Callahan relaxed. "Well, that's okay then. I misgive my misgivings. Irish coffee, anybody?"

Long-Drink exploded. "*How did you fucking do it?*"

"Well," Mary said, "you all have to promise not to tell a soul—anybody that isn't a regular, I mean . . ."

She was cut off by the sound of the blender as Callahan whipped cream for the Irish coffee. The big red-headed son of a bitch made us wait on eleventer-

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hooks until he was done, had Mary hold off until he had Blessed everyone in the room, then waved her to go ahead. Jim and Paul were smiling their faces off. I took a deep gulp of my own black magic healing potion, and decided that Callahan had good instincts and a nice judgment.

"You all know," she said, "that Mick and I have been spending our honeymoon traveling. I'd always wanted to see the world, and what with one thing and another I'd never managed to find the time to visit more than a dozen countries or so. So Mick indulged me. You know, it's funny how fast you can use up the tourist attractions of this planet when none of your time is wasted in the fiddle-faddle of getting there, and hauling and storing your stuff, and eating and drinking, and all of that chaff. On top of that, I hardly ever sleep since I took up with Mick—I don't *need* to anymore, and it makes me feel a little silly and selfish to go off and leave him for eight hours at a time like that. So in an astonishingly short time I discovered I was bored and there was nothing left to see.

"Well, you all know how polite this big cyborg is, but eventually he broke down and managed to diffidently suggest that Terra is *not* the only or even the most beautiful tourist attraction in this solar system.

"You want to know the truth, people? It's not even in the Top Ten . . .

"So lately we've been doing some *real* traveling, having a wonderful time. One day we were hanging out in The Rings—"

"Saturn?" I burst out.

"I *said* it with a capital 'T,' Jake. Hanging out in The Rings, just sort of digging, you know, and chewing the fat now and then. We talked about the Cockroaches" (the name Mary came up with for Finn's former employers when she could not bring herself to call them The Masters) "and some of the other planets and civilizations he's seen, and so forth. And of course Topic A kept coming up—you just can't look at a sterile planet for long without thinking about it—and all of a sudden Finn asked me a question."

Just like a human husband, Finn interpreted her pause and took up the tale. She's had a considerable effect on him. "The news had been full of the Disarmament Talks when we left; you will recall that the Russians refused to even discuss the subject unless Reagan promised to abort his plans for a defensive satellite network—"

"Oh," said Long-Drink, "You mean the Star W—" Callahan hefted the big fifteen-cup coffee pot in one hand like a set of brass knuckles. "—the Satellite Defense Initiative, sure," the Drink finished.

"Yes," Finn agreed. "I asked Mary: why does not Reagan say to Dubrovnik, 'Let us mutually agree to found together, in a neutral country such as Switzerland or New Zealand, *a single factory* which manufactures defensive satellites; divide the inventory at random; and launch them two by two until each side feels safe. Until that time is reached, each of us shall have a button which will destroy the factory if he suspects the other is cheating in any way.' In that way—"

"If the Russians could build them things on their own, they'd be doing

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it," Long-Drink said argumentatively. "The U.S.'d contribute a lot more to the party than the Russians."

"So what?" Finn said simply.

The Drink opened his mouth. After a moment he reached up and closed it with his fingers.

"So what'd you answer, darlin'?" Callahan asked his daughter.

"I told him that it wouldn't work, but I couldn't explain why not. He said that was his thinking too; just checking. But it gave me a honey of an idea—"

"I am ashamed that I never thought of it myself," Finn said. "It is so obvious—"

"My love," she told him, "from a human's perspective there are only two deficiencies in your character: aggressiveness, as we discussed before, and audacity." *And a sense of humor,* I thought jealously, and suppressed the thought. Funny how you start censoring yourself when there's a couple of telepaths in the room. "But not imagination. Once I laid it down, you picked it up and ran with it." She turned back to the rest of us. "Mick's thoughts had been along the lines of figuring out some way to destroy nuclear warheads, and of course the problem was that even he couldn't get all of them simultaneously—and anything less would probably *trigger* a nuclear exchange. Even if he managed it, he might have just kicked off a conventional war that'd be damn near as bad. Well, it occurred to me that a satellite umbrella system would make the nut just fine, except that neither side wants the other to have one *first,* and they're too damn paranoid to coordinate or synchronize with each other.

"So Mick and I decided to do it for them."

After a frozen second or two, people began to grin along with Jim and Paul.

"We ducked over to the Asteroid Belt for raw materials, Finn drew up the blueprints and I set up a smithy, and we started turning out defensive satellites, free-lance. A little more sophisticated than the ones Reagan's advisors have in mind. They're in place now; we just hung the last one an hour or two ago."

Callahan frowned. "You sure nobody caught you at it?"

"Relax, Mike," she told him. "Nobody sees Mick, on any wavelength whatsoever, unless he wants them to. As for the hardware, the largest components, the four system brains, are the size of ghetto blasters—and more transparent than glass. You could *tell* NASA roughly where they are, and give them twenty years, and they'd never find 'em."

A wave of elation was beginning to rise in the room, but Doc Webster still wasn't convinced. "Mick, you and Mary have put a crimp in nuclear war, but I don't know that you've stopped it. Who says they've got to use ballistic missiles to deliver the damn warheads? They'll just go back to bombers, and atomic cannon, or a bunch of secret agents'll get as busy as squirrels *mining* each other's territory with the goddam things."

Finn smiled. "Sam, if you wanted to stop an Indian attack, would you build a weapon that kills horses? Why would I want to harm ballistic missiles, which after all are fairly intelligent machines? As you know, I feel affinity with machines, being partly one myself. I did

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not say that Mary and I built ABM satellites. I said we built defensive satellites. They do not detect rising birds. They detect armed warheads, and disarm them. In about twelve nanoseconds apiece."

"But for gosh sakes, don't tell anybody," Mary said. "A general tends to freak out when he finds out his dick won't shoot. Of course, if they're dumb enough to let the situation, uh, come up, then the hell with their feelings—but for now, let's leave them with the comforting illusion that they hold the fate of mammalian life in their hands—it'll keep 'em out of serious mischief."

A rebel yell went up from someone, and like the first firecracker in a string it kicked off the loudest, and happiest, and most sincere cheer I had ever participated in or heard of in my life. It started loud, and built to a crescendo, and then squared itself, and then sustained, and eventually, there being a limit to the capacity of human lungs, dwindled, dopplered down, attenuated, and finally was reduced to a single voice. And, astonishingly, the voice was very soft, very quiet, very flat, almost totally devoid of any emotion at all. It was an oddly chilling effect. *Oh, for heaven's sake,* I told myself, *it's just that it's Finn, and he forgets to put expression into his voice sometimes,* and as my blood started to unchill it froze solid because I heard what he was murmuring so gently, over and over:

"I have made a terrible mistake."

What made it even more horrible was that Jim and Paul MacDonald, dumbstruck, were nodding along with him.

Mary's face paled; I think if both her parents had been Caucasian she would have been white as a sheet. "What *is* it, Mick? What's wrong, for Christ's sake? I thought about it for weeks, you thought about it for hours, *what did we miss?*"

If anyone could have reached Finn it was Mary, but he didn't seem to hear her. She shook him, kicked him in the shin, and beat a tattoo on his face with her fists, without attracting his attention; he was a tall thin juke-box with a stuck record, repeating over and over again, "I have made a terrible mistake."

"Jim," Callahan said sharply, "what's wrong with him?"

But it was older brother Paul who answered. "The same thing that was wrong with me the first night my brother came in here, Mike. He's mindblown."

"Damn straight," Tommy Janssen said. "But what by?"

"We'll get to that," Callahan said. "First of all, how do we get him out of it before he wears a groove into his brain?"

"It won't be easy," Paul said. "When something scares you shitless, you just go back up inside your head and hide. But when the thing that scares you *comes* from inside your head, you . . . well, you go to a place that isn't a place, erasing your footsteps behind you. It'll be hard to find him: even he doesn't know where he is right now."

"I can get him back," Mary said positively.

I halfway expected her to borrow Callahan's scattergun and shoot Mick in the head—it seemed like a reasonable idea; it couldn't hurt him or anything—but what she did was, if you think about it, even more dramatic.

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She leaned close to him and said, quietly but clearly over the sound of his litany, "Mick, I need you."

"Yes, Mary." His eyeballs powered up, tracked her, and locked on.

"Standby mode, sweetheart. I'll reboot you when it's time."

"Yes, dear." His face smoothed over, and he turned to stone.

"Nice job, Mary," Paul said.

"Oh shit," she said, "the *job* hasn't started yet. Before I start him up again, I've got to have his universe rebuilt for him, or he'll just split again. So start talking: what's his problem?"

"Oh, it's ours too," he assured her, "and it's a beaut. Finn's Masters just entered the fringes of the cometary zone. They're headed this way."

"The fucking Cockroaches." Mary whispered, and literally pissed her pants. She glanced down at the widening stain on her jeans, smiled, and Paul and Jim caught her as she started to fall. She's so big it's a good thing there were two of them, but they got her down gently. She was out cold. Neither Mike nor I had even started to move to help her.

"Oh, spiffing!" Jim said. "Two down, one dozen to go."

He was paraphrasing a mordantly funny *Fawlty Towers* episode known to every one of us in the room, in a very good imitation of John Cleese's voice, and it may sound horrible but it was the most perfect way I can imagine to reach all of us, keep *us* from going bugfuck too. Nobody cracked up, but nobody cracked up either, if you follow.

"But it's impossible!" I burst out. "He said they wouldn't—they're cowards—he said they'd write him off when he failed to report—"

"Wishful thinking, maybe," Callahan said softly.

Paul and Jim shook their heads. "No, Mike," Jim said. "To the best of Finn's knowledge, what's happening is unlikely to the point of impossibility. He can't account for it. There's got to be something he doesn't know about the situation. My own suspicion is that he's not as expendable as The Cockroaches told him he was, for some reason, but that's just a hunch. In any case, they're on the way."

"Do they know that Mickey's here?" Callahan asked.

Jesus—if they did, they were on their way to *this room*.

"Not yet," Jim replied. "But they will, soon. Finn's expecting to hear the call any minute: *'Report!'* When it comes, he'll answer it. Nothing in the world he can do about it."

"Not even in that condition?" Callahan asked, gesturing toward the catatonic Finn.

"He's not capable of ignoring a direct command from a Master: he's counterprogrammed. That's why he needed you folks to help him, that first night he walked in here."

"No sweat, then," Callahan said, and reached under the bar for the chloral hydrate. "We'll just slip him another shot of his namesake." It happens that chloral hydrate is one of very few things that affect Finn exactly the same way they do a human: it is about the only thing that can render him truly unconscious.

"It's not that simple. Mary put him on standby—"

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"So we pry his mouth open and pour the stuff down his throat—"

"Mike, in this mode, his stomach won't uptake."

"Oh. Well, can you power him back up again?"

"We'll have to wake Mary up: she's the only Authorized User inside the orbit of Neptune. Give us some silence, people. She's had a shock; it's going to be hard to do this without damaging her . . ."

We shut up and let them work. After maybe five long silent seconds Mary opened her eyes and sat up. "We'll have to hurry," she said. "The Roaches could jerk his chain any second now." She got to her feet quickly enough to surprise even me, who has reason to know how limber she is. Obviously Jim and Paul had brought her up to date in the process of waking her. "It's time to get up, darling."

The statue of Finn came to life. The eyes started to smolder.

"Don't worry, now," she said quickly. "Open your mouth and drink what I give you."

"Yes, Mary."

Without taking her eyes from him she held up her hand, and the little bottle of chloral hydrate that Callahan tossed landed squarely in it. (I thought of my own father, and Mount Washington, and a hat.) "About thirty cc's," he called, and she beheaded the bottle and poured that dosage past her husband's teeth. Fast Eddie and Long-Drink and I were alert; we reached Finn in time to help Mary and the MacDonalds break his fall. Finn's more than six-eleven, but thinner than me; he looks and moves like he weighs less than his wife. But this was the second time I'd helped carry him, and I'd guess him at six hundred pounds or better. Lead in the alloy? A grain of neutronium? I'd always meant to ask. We laid him out near where Mary had been a moment ago, straightened up and rubbed our kidneys.

"Well," Long-Drink rumbled, "everything's fine, now. Finn's the most powerful critter that every walked the Earth, and the people who scare the crap out of *him* are on the way to exterminate us, and we've successfully put out the lights of the only guy who might have any ideas. Anybody feel like playing darts?"

"We've still got Finn, in a sense," I said. "Jim-Paul, you took a reading on him."

"All we've got is data," Paul answered for them. "Not the metaprogrammer part, the part that generates ideas and thinks ten times faster than a human." He looked helpless. "And not much of the data, either. We've never been able to read more than about fifty percent of Finn's mind, and we only got maybe the surface five percent of that—a human brain just doesn't have the storage capacity, Jake. Not even two human brains."

"Mike," Long-Drink McGonnigle said hollowly, "drinks for the house, on me."

Do you know, I had room left in my brain to be startled by that? Of course, I realized at once, he was going to put it on his tab . . .

"Did you get a reading on how soon the Cockroaches will get here?" Mary asked as Callahan began passing out fresh booze. "And what'll happen when they do?"

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"They'll check Mars first, then come here; they should reach high orbit in an hour or so. Not having heard any response from Finn, the first thing they'll do is to scan the planet for clues to his fate. If they don't find any, they'll sterilize Earth and go on to check out Venus—then when they don't find him there either, I guess they'll—"

Fast Eddie spoke up from his place on the piano bench. "I don't t'ink I give a shit what dey do after dey sterilize de Oyth, Paulie."

He sighed. "I don't suppose I do either, Ed."

"What happens if they *do* find Finn?" Callahan asked.

"If he wakes up between now and then, you mean? Why, I guess they'd come here and look him over, find out what caused him to malfunction and see if he could be restored to service. *Then* they'd sterilize Earth—probably have Mickey do it for them, to make sure he was working properly again."

"How many of 'em do you figure there are?"

Both MacDonalds shrugged. "Impossible to say, Mike. Finn couldn't come up with a reason why *any* of them would come here."

"Are they vulnerable to anything?"

"Oh, yes. If they were as strong as Finn, they wouldn't need scouts like Finn. That's why he can't imagine what would bring them here; he's certain there are no other scouts along with them. Anyway, all you'd have to do is detonate a small tactical nuke in their immediate vicinity and you'd have Cockroach Soup."

"Well, hell," Doc Webster said, "NORAD can handle that! With Finn to spot for 'em, maybe . . ." He trailed off as it dawned on him. "Aw, shit."

"NORAD doesn't have any H-bombs any more," Callahan rumbled. "Mick *said* he made a terrible mistake."

Mary buried her face in her hands. "Oh, Pop! *I made it too!*" She began to sob.

I wanted to rush to her and comfort her, take her in my arms and tell her everything was going to be all right. I never moved a muscle and I never said a mumbling word.

Her father came around the bar and put an arm around her. "So did I, darlin', so did I. Not your fault. We guessed wrong, that's all."

"Pop, what'll we do now?"

"I'm not exactly certain, hon', but the first step is to blow our cover."

Her head came up fast. "Are you *sure?*"

The big barkeep grinned at her, waggled his cigar. "Hell, no! Got a better idea?"

She frowned. "I guess not. Your privilege; they're your family."

Callahan turned to the rest of us. "Folks, I'm afraid it's time for Mary and I to face the music, and tell you people who we really are . . ."

And having said that much, the big red-headed son of a bitch stood there and looked at us for a while. He's always had a pretty expressive face, but I'd never seen so many expressions chase themselves around it before. And while I've always known that Michael Callahan was a subtle and thoughtful man, I'd known it by his actions more than his face; his expressions had always been sort of carved out in broad strokes

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before. This was a change so sharp as to be striking. Somehow I knew that I was looking at a different man. No: at a different side of a man I knew. It was something like watching a brilliant actor step out of character after the lights have gone out.

It was exactly like that. I began to add up a number of things that I have always known, but somehow had never felt inclined to think about for very long. Not, say, for long enough to reach the inevitable conclusions.

I glanced toward the MacDonalds. Jim's eyes were waiting for mine, and he was nodding. I opened my mouth . . . then shut up and let Callahan say it.

"Friends," he said slowly, "this isn't going to be easy. A lot of words I need, I don't have. Not that they don't exist, but none of you know 'em—and I don't have time for a language lesson. Uh . . . Mary and I aren't from around here—"

"We know that, Mike," Long-Drink said. "Brooklyn, right?"

"Dat's where me and Mike hooked up," agreed Eddie, the oldest denizen of Callahan's Place. "At Sally's joint."

Callahan shook his head. "That ain't where I'm from, boys."

Eddie shrugged. "Well, you never said it was."

"Thanks, Eddie." Callahan smiled at the monkey-faced little piano man. "I'm pleased you noticed that."

"All right," Doc Webster said. "I'll play. Where *are* you from?"

"A place that calls itself Harmony."

"Isn't that in New Zealand?" somebody asked.

"Nope. It's about twenty billion miles farther away, and quite a few years from now."

There was silence for a time. Mary sat down at the nearest table and commandeered someone's neglected drink. She watched Finn snore while she sipped it.

"Well," Doc Webster said finally in a conversational tone, "that explains a lot. Always said there was something weird about you, Callahan. Anyone who would permit puns like mine in his establishment is just not normal."

"Time traveler, huh?" Tommy Janssen mused. "You must be from further up the line than The Meddler or Al Phee."

"Or Josie Bauer," Callahan agreed. "To my time, yours and theirs are pretty much indistinguishable."

"How far is that, Mike?" I asked.

"Well," he said, "where I come from, the human race has got it together. Nobody's hungry; nobody's angry."

That far!

"And we're startin' to learn a few things. Oh, we'll be a *long* time learning—but at least we're finally on the case."

"Jesus Christ," I said faintly, "I wish I had time to ask you about five hundred questions."

"Me too, Jake," he said. "But I'll tell you right now, better'n half of them I'd never be able to answer, in any words that'd have meaning for you. Like, right now, most of you are probably wondering about time paradoxes and so forth, and the answers simply won't mean much to you."

"Let's try anyway," Doc Webster said. "Did you know this showdown with Finn's Masters was gonna happen?

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Is that why you've been running this bar all these years?"

"Yes and no," Callahan said promptly. "See what I mean?"

"Dammit," the Doc growled, "I started out this night saying that all questions have answers."

"If they're meaningful," Callahan agreed. "Doc, you just plain can't frame a meaningful question about time-travel in English. The language itself hasn't got the room: it's based on the assumption that time travel is not possible."

The Doc frowned. "So it is. Can you do any better than 'yes and no'?"

"It is known in my time that *some* event takes place at this locus in space/time. Something so major, so crucial to the history that produced my time, that it makes Pearl Harbor seem no more important than yesterday's hockey scores. What that event is, is hidden from us. So is the certainty of its outcome. Some things in our past we can't affect. Some things we *have to* affect. We don't always know the difference. And no, that's not the only reason I set up this bar, although it would have been enough. I know all that doesn't make sense, in English, but if you want me to do even a little better than that, we'll still be talking when the Cockroaches get here."

Good point. "All right," I said, "let's cut to the chase. You've got to have some kind of futuristic wonder-gizmo you can zap the Cockroaches with, right?"

I don't know when I've ever been sorrier to see a man shake his head. "It doesn't work that way, Jake. You have to work with available materials. Whatever's already in place in that space/time."

"Mike—" I hesitated. "If it was anybody but you, I'd say that was preposterous. How do you get your own time machine through?"

"We don't use machines for time travel."

"Oh." I would think about this another time. If there ever was one. "But in any case we can relax, no? At least a little? The fact that you're here, from our future, means that the human race is *not* going to be exterminated in the next hour, *nicht wahr?* But we could suffer heavy casualties or something?"

That was when I've been sorrier to see a man shake his head. "Again, Jake, what you're saying sounds logical —because you're saying it in English. Take my word for it: my home space/time is just as likely as yours to stop existing in the next hour or so. Worse, to stop ever *having existed* in this continuum. If the Cockroaches steam-clean this planet, there'll be no way for my home ever to come to pass." He frowned. "This whole era is a tinder-box; we've got agents spotted all through here/now, doing what we can to cool things out. But we always knew that there was going to be at least one really major something around about now. What we *thought* was that the crucial event in question would be a nuclear firestorm. The shape of history seemed to point that way. We thought we had it covered, thanks to Finn." He looked sadly at his catatonic friend. "But it was us made the awful mistake, not him."

Long-Drink McGonnigle summed it up very succinctly, I thought: "Aw, shit."

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"Don't feel bad, Mike," I said. "You bet with the odds—nobody can fault you for using Occam's Razor."

He shook his head ruefully. "Thanks, Jake—but you'd be surprised how many chins William can't shave. With the stakes this high, we should never have bet the farm."

"William who?" Fast Eddie wanted to know. "And what's dis about razors?"

That almost made me smile. Eddie must use an electric razor with an offset shim: at all times, he has exactly three days' growth of beard. "William of Occam, Eddie. Stated the principle of Least Hypothesis—"

"Is dat, like, cheaper than a rented hypothesis?"

Bless the runty little piano man, that *did* make me smile, and simplify my explanation even further than I had planned. "Occam's Razor is a principle that says, if there's more than one explanation for something, the simplest one is most likely to be true."

"Not 'certain,' " Callahan amplified. " 'Most likely.' "

Eddie looked thoughtful—not an easy trick with that face—and shook his head. "I dunno. Most o' my life, de complicated explanation was de one to bet on. I don't buy dis William o' Whatever—"

"Occam," I said.

"—an' de horse he rode in on," Eddie agreed. "He sure got it wrong dis time." He frowned slightly at our grins. "Well, what's our next move, boss?"

The grins went away.

"Mike!" I said, as an urgent thought struck me. "It's New Year's Eve! The rest of the gang are going to start showing up any second—all of 'em, not just the regulars. Shouldn't we try to head 'em off? Go set up roadblocks? *Something*?"

He took one of those foul cigars of his from a shirt pocket and sniffed it meditatively. What more proof did I need that he wasn't a normal human being? "I don't think so, Jake. In the immortal words of Percy Mayfield—"

"—'The Danger Zone is *everywhere*,' yeah, I understand that. They're no safer at home than they would be here. But do we want 'em all around underfoot, complicating the fight?" I felt my voice get hoarser. "There's going to be a fight here, isn't here?"

He lit his cigar. "Damn straight there is," he rumbled. He dropped the dead match on the floor, trod it underfoot, and took Mary's hand. "Damn straight." Suddenly he grinned. "But who ever said a fight was complicated by reinforcements? Let 'em come, by Christ. Let 'em all come! If we have to, we can all go to Hell together—maybe there's a group rate."

"Callahan's right, Jake," Long-Drink said. "There ain't a one of the gang wouldn't rather be *here* on Judgement Day, and you know it."

Doc Webster nodded vigorous agreement, jowls flapping. "Damn well told. If the world is about to end, we can at least have a drink on it together before we go!"

There was a general chorus of agreement.

"All right," Callahan boomed, "let's get to it. There's two phone lines in this joint, and the one for the computer is miked. I'll boot the directory disk and get a printout by last name—I'll take A

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through M; Doc, you take N through Z—''

''Mike,'' Jim and Paul McDonald said simultaneously.

He broke off and tried to look at both at once. ''Yeah?''

''It's not necessary to use the phone,'' they chorused.

He looked startled—then broke into a big grin. ''Why, no, it ain't at that. What's your range these days?''

''With *family?* Callahan's People? We could find one of you on the Moon if we had to.''

''Go to it then, sons.''

Jim and Paul found a vacant table, sat down at opposite sides. They took each other's hands and smiled at one another. Then their eyes rolled up and their mouths went slack and they seemed to slump slightly.

Can you remember the very first time you used stereo headphones, and heard a voice speaking or singing *inside* your head? Or were you too young at the time to find that remarkable? This was a little like that: perceiving ''sound'' where sound had never been before.

(Further: You know that with stereo headphones an aural image can seem to move, from left to right or the other way around. In the Decca, Georg Solti recording of Wagner's *Der Ring des Nibelungen* there's a passage in which Fafnir roars—and on headphones the sound seems to move *up*, from your throat to the crown of your head. An illusion, of course, and I've always wondered how Decca's engineers managed it. Similarly—and just as impossibly—the combined ''voice'' of Jim and Paul McDonald, which I heard now in my head, seemed to move *from back to front*, as though two tiny Paul Reveres entered the back of my skull, transited my brain at high speed, and left through my forehead.)

The double-tracked voice was calm—but so emphatically urgent that I was certain it would have waked me out of the soundest sleep.

''Mike Callahan needs you,'' it said. **''Hurry!''**

The cold winter wind was choppy at this height, and the ledge was slippery; Walter clutched at the brick facade with slowly numbing fingers and at the pretty brunette's gaze with tearing eyes. She was nice to look at, leaning out the window, the last pretty girl he ever expected to see—but he knew all the things she was likely to say, and knew that none of them would work. ''You're wasting your time,'' he told her and her husband, whose head was visible beside hers. ''I know all the cliches, and I just don't want to talk about it.''

''You've got to come in soon, Walter,'' she called from the window. ''If you stay there much longer you'll get Window-Washer's VD.''

''What?'' To be surprised astonished him.

''It's a terrible thing,'' the husband said earnestly. ''You get a watery blue discharge, with a funny smell.''

''What the *hell* are you talking about?''

''Herpes Windex,'' she said.

He laughed long and hard, to a point just short of hysteria. ''You two really are good at what you do, you know that? I was in a lousy mood. This is a better mood to die in.''

''That's something, at least,'' the

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husband called over the sound of the wind. But—''

''I still don't want to talk about it,'' Walter yelled. ''Why I'm doing this is none of your business.''

''Nobody asked you,'' the wife said. ''What Les and I want to know is why you're doing it so badly.''

He blinked at them.

''Merry's right. Some janitor has to mop up you and his breakfast; a bunch of cops and ambulance attendants get brought down; a whole streetfull of passersby have a great dark demoralizing omen literally drop into their lives—see that little girl across the street down there? Her mother is the one who's going to need to explain this, not us.''

''And what *about* us?'' Merry asked. ''We're professionals, with a reputation to protect. You hired us to come over here and try to cheer you up. You say we succeeded, and now you want to skip out without paying. Are we supposed to—'' She broke off short.

''You don't understand!'' Walter shouted to the night sky. He closed his eyes, and sighed deeply. If he told them how it was, they would see that he really had no choice. ''All right: I'll explain it to you. You deserve that much.'' He turned his face back to them, to see the empathy he knew he would find in Merry's eyes, and she and Les were both gone from the window. ''Hey! Do you want to hear this or not?'' There was no reply. *''Hey!''*

The Cheerful Charlies were gone.

Walter stood there on the ledge, confused, unready to jump, too stiff and cold to risk climbing back in the window unassisted, his scenario thrown completely off the rails. Anger came to him, bringing warmth to his fingers and strength to his limbs. He made it safely inside, and reached the street in time to see the Charlies driving away; furious, he flagged a cab and followed them.

Patrolman Jimmy Wyzniak trailed the Sergeant through the empty corridors of Suffolk County Police Headquarters; the only sounds were their footsteps and the occasional ringing of phones that no one was going to answer. Jimmy was young, and just barely experienced enough at his job to have some appreciation of the magnitude of his ignorance, but he had no fear: his Sergeant was with him, and the Sarge was the best there was. Bad luck, not carelessness, had cost him his right foot.

''People are sure funny, you know?'' Jimmy said plaintively. ''I mean, Captain Whitfield is taking this like it was personal—like they put it here just for him. Never seen him so mad.''

The Sarge spoke over his shoulder. ''You notice he didn't try to do the damned thing himself first. He called for the experts.''

Jimmy shifted his trunk-shield like an umpire looking for a fresh plug of tobacco and grinned. ''Well, that just proves he's smarter than we are.''

His mentor snorted. ''Son, *everyone* is smarter than we are. Here we go: Storage Closet 5. The phone tip said it was in here.''

''Who claimed this one?''

''Who cares?''

''Boobies on the door, you figure?''

''Never can tell—so we assume there are.'' Jimmy set down the heavy backpack of equipment, and they spent a few minutes assuring themselves that the

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door was *not* boobytrapped. "I hope they're professionals," the Sarge grunted. "Pros are tricky sometimes—but at least they use good equipment. An amateur job, who knows *what* the hell it's gonna do?" Then, rank having its privileges, the Sarge sent Jimmy thirty feet down the hall and around a corner. The young patrolman waited anxiously, heard the sound of the Sarge trying the knob.

"Zoroaster in lingerie," he heard the Sarge say.

He ran back and looked through the door of Closet 5. "What the hell is it?" he asked. "That doesn't look like anything we covered in training."

I saw one once," the Sarge said very softly. "When I was in the Army. I'd guess it's not especially powerful—nothing like the one that did that slum clearance on downtown Nagasaki. By today's military standards it's not even a cherry bomb."

Jimmy regarded the object. "You're saying that's a nuke," he said in a calm, conversational tone, as though confirming the time—then, big: "*It looks like a fucking miniature vacuum cleaner!*"

"Sure does—probably doesn't weigh more than thirty pounds all told. Now, the military could make one that size with some real bang onto it—but looky there at the airline bag they carried it in. Amateur job."

It was not machismo that kept Jimmy's cool for him—this was beyond even the machismo of a demolitions man. But if the Sarge wasn't worried, Jimmy wasn't worried. Hell, the Sarge could probably disarm ICBMs in flight if he had to! "So it won't do more than annihilate Riverhead if it goes off, huh?"

The Sarge shook his head. "Not even that bad, is my guess. This building, for sure. The block, possibly. This thing is just a pony nuke."

A guess for Sarge was Gospel for Jimmy. "So what's our first move?"

"Well, that time-fuse says it's got almost two hours left. That should be plenty of time. I suppose we—" The Sarge broke off, stood as though listening to something. Jimmy smiled: the Sarge had done this several times before, with conventional but difficult bombs—explaining afterward that he was "trying to outthink the guy that built it"—so everything really was okay after all. Any minute now, the Sarge would—

—start running like a bastard, artificial foot and all, back the way they had come—

"*Sarge!*" Jimmy cried, but his instincts were good: he was already in motion. His legs were good, too: he was neck and neck with the Sarge within twenty strides. Suddenly the Sarge put on the brakes and doubled back; Jimmy did not. As he cleared the door to the outside Jimmy could hear the Sarge's uneven footsteps coming up fast behind him again. Captain Whitfield and the other cops waiting outside scattered in all directions when they saw both running men.

The Sarge made a beeline for the Bomb Squad truck, leaped behind the wheel. He was carrying an airlines bag.

"Sarge! God damn it—hey, *Sarge!*"

Sergeant Noah Webster ignored him, started the truck, and sped off.

Ralph spotted a likely-looking bitch, got close enough to smell her, and

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growled deep in his throat. He had little difficulty in cutting her out of the pack she was with. He knew, as they did not, that in a matter of hours she would be panting for it. Confusing and mesmerizing her with his deep, softly accented voice, he led her away from her friends and into the darkness.

Sound Beach is a seasonally schizophrenic area of Long Island. For Ralph it was a walk on the wild side—literally. In the summer the vacation cottages are filled with the nearly-wealthy. In winter the region is sparsely populated by half-frozen college students from the nearby State University—and by packs of feral dogs. They are the watchdogs routinely abandoned by the nearly-wealthy at seasons's end. Dobermans, Shepherds. They pack-up, and raid garbage cans, and kill and eat the pets of the college students, and it is usually February or March before the county cops have shot the last of them. As a general rule, by the time they are hungry enough to attack a human, they are too weak to pull it off—though there are occasional exceptions.

Ralph Von Wau Wau neither smelled nor behaved domesticated, and he sounded like Arnold Schwarzenegger in pitch, tone, accent and confidence; he could move among his savage cousins in relative safety. He had only been forced to fight twice in the five years he had been wintering on Long Island, and had won both fights handily. The feral dogs were cunning, but Ralph was intelligent, and it made all the difference.

Though he was a mutant, Ralph had all the normal urges of any red-blooded son of a bitch, and house pets just didn't do it for him. Too tame, too boring. His true preference was for women, and he was currently on intimate terms with half a dozen—but three were vacationing to the south with their husbands, two were preparing final exams for their students, and one was preparing to run for reelection. Ralph had not gotten laid in several weeks, and his opinion was that the next best thing to an adventurous and sophisticated lady was a wild outlaw bitch. They were less inventive, but more instinctively satisfying—and crossfertile besides.

He had certain moral rules of his own devising, which might seem exotic to a human. He always fed a bitch, before and after. If necessary, he protected her to the best of his ability. If she got pregnant, he behaved as honorably as any other dog would—and scrutinized the offspring for indications that his mutation might have bred true—which so far it had not. If a hyperintelligent pup *had* resulted, he would have bent every effort to get it the same larynx-modification surgery he himself had once had, and would have taught it to talk. But by now he had almost given up hope.

He'd tried moving a few mates in with him, but it never worked out: they never really had enough in common to relate to one another, and it always upset them when he typed for hours at a time.

This particular bitch excited him a great deal, for reasons too subtle and subconscious for him to analyze. (Regrettably, the Freud of canine psychology has not yet emerged.) Something about the fur at the back of her neck, something about her walk, something about her smell . . . there was no defining it. She was new to him, puzzled

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by the contradiction between what her eyes and nose told her, and what her ears told her, and he found her innocence charming. She was cooperative, but not slavishly obedient. Her eyes flashed. Her scent was . . . piquant.

So they gave the rest of the pack the slip, and he took her to a warm and sheltered place he knew. There he opened a can of deviled ham—a rather extravagant wooing-gift, but one of the annoyingly few meats available in pop-top can format—and waited politely while she wolfed it down. Then they romped a bit, and nuzzled a bit, and presently he taught her some things about foreplay that astonished her. (The Masters & Johnson of canine physiology have yet to emerge as well—but when they do, Ralph Von Wau Wau will be massively represented in their footnotes.) Shortly after that, she taught him some things about hindplay. As mentioned, Ralph was a love 'em and leave 'em sort of fellow, but the summons from Jim and Paul MacDonald came at an extremely unfortunate, uh, juncture, and he was compelled to bring her halfway to Callahan's with him . . .

Joe and Susan Maser had sent their wife Susie on ahead to Callahan's because they wanted to put the finishing touches on the chili they intended to bring for the New Year's celebration; the summons came as Joe was stirring up the coals in the firebox of his woodstove. He dropped the poker and sprinted with Susan for the car, leaving the firedoor open on the stove. Pulling out of the driveway, he realized what would probably happen, but he didn't have time to do anything about it. Behind him, the draft whipped the fire to its hottest and sucked all the heat up the chimney . . . which had not been cleaned recently enough. Since Joe and Susan had also left the front door of the house open, much the same thing eventually happened to the building; by dawn all the Masers would own was the clothes on their backs and the contents of their pockets.

Similarly, Shorty Steinitz left his lovingly restored '57 Thunderbird jacked up with one wheel off by the side of Route 25A and ran the last quarter-mile; he never saw it again. Lady Sally McGee was entertaining a very old and dear friend when the call came; he had never been intended to remain in that position for more than fifteen minutes, but the silken cords were strong, and he could not reach the slipknots. Pyotr left his bottle of breakfast sitting on his kitchen table, and few foods go bad faster or uglier than blood. And Bill Gerrity was caught in the middle of getting dressed: this would have been embarrassing for anyone, but for Bill "half-dressed" for a party meant dark nylons, purple garter belt, black panties and an hour's worth of makeup (high heels too, but he ditched them within the first half block); in the three and a half miles he had to jog to Callahan's, he was forced to hospitalize four young toughs who mistook him for a homosexual, two policemen who correctly identified him as an attractive nuisance, and a persistent politician who simply would not get out of the way.

It was not, in short, without cost that the men and women of Callahan's Place answered the Call, even though nearly all of them were getting ready to go

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there at the time. But it is a matter of proud record that every single one of them paid the cost unhesitatingly. Within an hour, the Place was packed to capacity with all the regulars past and present, with all the people to whom this tavern had ever been *home* for a time, and nobody had any complaints to make. The MacDonald brothers had followed up their initial Call with a synopsis of the situation; everyone arrived with a fair grasp of what was going on.

Josie Bauer was the first to arrive, of course, since it took her literally no time at all; she materialized before the bar, took the shot glass of Irish whiskey that Callahan was holding out for her and set it down on the bartop, plucked the cigar from his lips and kissed him firmly. "You sneaky bastard," she murmured. "I never guessed. I should have guessed. You must be from *much* further up the line than my outfit."

"Not as much as you might think, hon'," he told her.

She turned to Mary and kissed her too. "Hang in there, sugar. He'll be okay."

The next arrival was Shorty, and he did just what Josie had done. I'd be willing to bet Shorty had never kissed another male in his life before, but he did so with no hesitation or sign of embarrassment. That set the pattern. Every new arrival, and those already present, collected a shot and a kiss from Callahan and his daughter. No one drank; we waited for Mike to propose the toast. All of us were smiling, and all of us were crying, and all of us were touching, and none of us said a word, save for occasional briefly murmured greetings to old friends too seldom seen. No one had anything pertinent to say, and no one felt the need to mouth off without saying anything: it was enough to be together, to share whatever would come. I saw friends I hadn't seen in years—Ben, Stan, Don, Mary and Stephen, both Jims, Susan, Betsy, Diana, Shelley, Mark, Chris, Herb and Ricia, Susan, Joe and Gay, Jack, Railroad George, Ted, Gordy, Dee for Chrissakes, Tony and Susan, Wendy, Bob, Tom, Kirby, Eleanor, and of course David—and it came to me as the crowd grew and the Place filled up that I could not have asked for a better time or place to die. There was no place on Earth or off it that I loved as much, nor any people I had ever loved better—no, not even the wife and daughter I'd killed a decade ago by doing my own brake-job with a self-help book—and New Year's Eve seemed an appropriately backassward date for Judgment Day.

After a little more than a half hour of murmured greetings, multiple embraces, and general warm happiness, Paul MacDonald spoke to Callahan. "Okay, Mike. Everybody who's going to arrive in time is here now."

The room became totally quiet, filled with a mood of exuberant desperation. The locker room before the big game. Backstage waiting for the house lights to go down. The hold of the Huey as the LZ appears in the distance.

We were as ready as we were going to be.

Callahan nodded slowly. "It's about time," he rumbled. He trod his cigar underfoot and lit a new one. "It's all about time." He poured a shot of Bushmill's for himself, walked slowly around the bar. "Isn't it?" The sawdust squealed

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under his boots. Fast Eddie left the piano and tossed a couple of sticks of dry birch onto the fire; there was a crackle as the bark began to catch, and that fine sharp-sweet smell of burning birch joined the symphony of pleasant smells in the room. Callahan toed the chalk line, faced the rattling hearth. I didn't mind the tears; they fell too quickly to obscure my vision. He raised his glass, and we all raised ours. The bright lights shattered on all that glass and the room sparkled like a vast crystal.

"To the human race," Mike Callahan said clearly in that gravelly baritone. "God help us, every one." He drank off the Bushmill's in one long, slow draught, smacked his lips, and whipped the glass underhand into the fireplace.

"To the human race," we chorused, and the largest barrage of glasses in the history of Callahan's Place began.

And when the great shout and cheer had subsided and the last shard of glass skittered to its final resting place, we began to build something.

I perceived it in musical terms, of course: to me what we built was something like a vast symphony orchestra, save that in addition to the usual ordnance of a full orchestra it incorporated saxophones, electric guitars, tin flutes, tablas, trap drums, Yamaha synthesizers, steel drums, vocoders, kazoos, baby rattles, Zal Yanovsky's Electric Gorgle and the Big Jukebox in *Close Encounters,* included every means the race has ever devised for making music and some that haven't been invented yet, the whole thing integrated into a vast tapestry of sonic and tonal textures that was indescribable and probably unimaginable—certainly I had never imagined anything like it before that night—and primevaly satisfying to what a Buddhist might call my "third ear."

Imagine that you assembled such a superorchestra in a room. First there is cacaphony, as each musician sounds his or her instrument and limbers it up, no individual or group predominating for more than a few seconds. Then one loud true voice takes up and holds a 440 cps A, and gradually everyone tunes to it; for several seconds everyone is playing the same note and it's like a giant "OM" chant. Then it diverges again, as each player goes into scales or warm-up exercises. Imagine then that, seemingly by pure random chance, the vast assemblage of instruments happens to stumble onto a single, stupendous chord, an accidental aural architecture of terrifying beauty, a chord so complex that the most knowledgable musician there cannot name it, yet so *elemental* that each feels he has always known it in his heart. It holds, swells, falters momentarily as percussive notes fade and lungs empty of breath and bows reach the limit of their traverse, then returns and steadies and fills the room to bursting, each musician thinking, *keep playing—yes, try to notice and remember what note you're playing, but for God's sake* ***keep playing,*** *if we lose this thing we may never find it again and if that happens I believe I may need to die—*

The thing we built was like that. There was no sound to it, any more than there was substance to it, but it hung invisibly in the air around us, annihilating the space between us, and to me that's music. The 440 A that we all

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tuned to was the voice, the essence, the nature of Mike Callahan, echoed and amplified by the MacDonalds. But neither he nor they led us to that "chord" —we found that ourselves. Shortly it changed from something as static as the word "chord" implies to something dynamic, as though individual musicians, confident now that the chord would not be lost, began to jam around it, to dress it with trills and arpeggios and scraps of melody and rhythmic accents; it changed from a pretty sound to true music, although no human ear could have resolved music like that. It was timeless, like raga, and frantic, like bebop; it swung like Carl Perkins, and it purred like Betty Carter; it was simple like Bach and complex like Ray Charles; it was hot and cool and hip and square and lush and spare—I know no music can be all those things altogether, but this was. In the back of my mind I could hear Lord Buckley, rest his ticker, talkin' bout, "My lords and my ladies, I'm gon' hip you: you may have heard a lot of jam sessions blowin' off, you may have heard o' New Orleans flips, you may have heard it Chicago style, you may have heard all kinds o' jazz jumpin' the wildest an' the most insane, you may have heard o' many musical insane flips, but you studs an' stallions an' cats an' kitties *never dug any session like these cats* ***blew!*** *. . .*"

To others present it did not suggest music at all. Shorty Steinitz was a sculptor; to him it was as though all of us struck together simultaneously at a magnificant block of Carrera marble, reducing it in an instant to a perfect and complete statue, which began in the moment of its creation to walk and talk. Susie Maser was a Modern dance choreographer; she felt that we were inventing zero-gravity dance together. Indeed, Long-Drink McGonnigle, who had cherished a perverse interest in entomology ever since February 7, 1964, felt that whatever it was resembled pictures he'd seen of webs woven by spiders in free fall, to form ". . . well, not a brain, not even a small one—but a ganglion, by God!" Tom Hauptmann, the former minister, perceived what we built as a perfect prayer, pleasing to God, who is a tough critic of prayer.

I do not know all this from having compared notes afterward. I knew it then, and everyone there knew and understood the analogy-mode that worked for me just as well as I knew theirs. Just because I perceived it as music didn't make it music for Fast Eddie: the little piano man felt that we were setting up and executing a hundred-cushion billiard shot in ultraslow motion and cascading instant-replay. Of course, he appreciated my appreciation of it as music—but no more than Tom Hauptmann, who is totally tone deaf (or rather, had been until then). Perhaps the most insightful analogy we conceived was that of Joe and Susan and Susie Maser, who saw us all as building a group marriage akin to their triad.

Or perhaps it came from Noah Gonzalez, who pictured us constructing, entirely by intuition, a cobalt bomb.

All this happened at the top of our minds, in the forefront of our combined consciousness. Along with that, we were simultaneously, but not separately, growing closer to one another, getting to know each other in even greater depth than we already did, shar-

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ing and cherishing. Tom, for instance, was discovering music for the first time in his life, and finding it both more or less than he had imagined it must be. Long-Drink and the Doc and I were discerning some interesting things at the root of our long-standing rivalry at punning. Tommy Janssen was understanding for the first time why heterosexual Bill Gerrity enjoyed wearing drag. Tom Hauptmann was learning things about eroticism from Josie Bauer that would have shocked him cockeyed an hour before, and she was learning equally unsettling things about chastity from him. All of us were learning things from the Callahans, husband, wife, and daughter, that I can't put down here. It's not that you don't have the words. You don't have the concepts to put words on.

At Callahan's Place we were used to sharing, to letting down barriers, to opening up to and for one another. Callahan's frequently-proclaimed policy of violently discouraging snoopy questions had always been a sham, a custom honored more in the breach than in the observance, a prohibition which we now perceived was designed to teach us to learn how to circumvent it—hell, the Cheerful Charlies had it down pat. Not to mention the MacDonalds. Or Callahan himself, who sucked secrets out of you with his twinkling eyes. We thought that we already knew what it meant to *be one* together; we had been students of sharing here for many years together.

This was more, deeper, stronger, better. A sizable fraction of the people there were folks I didn't know well or at all, ex-regulars from before my time who had still been alive and around to hear The Call, and Walter the failed suicide: while devoting the bulk of our individual and collective attention to the thing that we were building, we became blood brothers and sisters without wasting time or words.

Words. It is interesting that none of us perceived the thing we built in terms of a structure of words. It was sheer pattern-recognition—images, gestalts, sensory impressions and emotional rhythms, a nonstop cascade of data that reached even the subvocalized level only in scattered, fragmentary form, like verbal buckshot:

*(warm!/and so when she died I/Heavenly father . . ./merry, by God!/roll 'em baby/you're beautiful/thank you/you're beautiful too/thank you/*It's *beautiful/always wanted to tell you that I/do that again/ain't it?/never thought it could be like/pulsing/steady now/ere do I remember this fr/fast!/would have done the same goddamned thing my/take it/strong!/remember re-member re-Member ream ember/more treble, we're losing the highs/hi!/hie/hai!/never lose the/high/I/eye/aye!/**LOVE**/*U./ewe/hue/yew/***YOU***/too/U2/to/two/whoo!/***who?***/hew/Hugh/yoo hoo!/***YOU!***)

It went on forever, for whole seconds, repeating and changing and building like a series of choruses in jazz without any of us ever forming a coherent sentence in words. And yet when the time came to speak, we found that we could —although we were one, we retained our individual voices and the personalities they represented.

No, put quotes around "speak" and "voices." If there'd been a stranger in the room, he would not have heard or seen or felt a thing. To him we would

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have been a roomful of strange and twisted people, standing around a snoring basketball player, smiling dementedly at nothing at all, in silence . . .

"All right, ladies and gents," Callahan said, his voice clear and strong in my skull, "Let's get this show on the road. We need a plan. The floor is open."

"There ain't but the one plan," I said. "We get the Roaches on the phone and invite 'em over for a beer."

"*Here?*" two or three minds yelped.

"Sure. We badly lack data, and short of waking up Finn the only source is the Cockroaches themselves."

(A funny little thing happened then, entirely below the surface, that was over in an instant. I'm rather ashamed of it—but it's illustrative of something that was happening all around the room, so I'll tell it. A primitive ape who clings to my brainstem still wanted Mary Callahan, still perceived Finn as a rival —worse, a successful rival—worst, a superior rival. That ape heard me calmly trying to cope with a problem that had Finn catatonic with fear . . . and smiled, displaying the kind of teeth that apes only have on Frazetta covers for Tarzan books. For an instant, it felt smug—*I* felt smug. For a picosecond or two, the ape fantasized outcomes in which all of us survived except Finn, in which—just for once, oh Lord!—I ended up with the girl I wanted.

And then I saw Mary looking at Finn, and I beat that ape to death with a club. Maybe Finn was paralyzed with fear, not because he was more of a coward than I, but because he knew more about the situation. Or faced more stringent penalties than I did. My smugness rested on ego, my courage on ignorance.

Why I mention it is this. There were no unburied hatchets in Callahan's Bar —there never had been for very long. But now even the buried hatchets were starting to decompose underground, to rust away to nothing. I would always want Mary—but the best I could ever hope for would be to help her get what *she* wanted. I guess I was learning to live with that. Similar mini-Epiphanies were happening all around the room.)

"But why should they give us *any* data?" Mary asked. "What's our leverage?"

"We've got data *they* want."

"We do?"

"Locked up between Finn's ears, I'm sure of it. I don't know what it is he knows; apparently he doesn't know either. But the bugs came one Jesus long way to learn it. They're a cowardly race; they don't go in person to any place that a scout has failed to report back from without some powerful motivation; that's why Finn is so baffled. Well, they can't be that curious about *us* because they don't know us from pond scum, so it *has* to be Finn. Something in his memory tapes is worth the risk. Maybe we can cut a deal."

"I wouldn't bet on it," the Drink said.

"McGonnigle, you are going to have to. Right now."

"Jake's right," Callahan said. "Unless anybody here knows how to disable a bunch of invisible satellites and convince NORAD to go to DEFCON ONE within the next half hour, we haven't got much choice." He frowned. A telepathic frown itches. "Another thing.

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We have to call the Cockroaches *right away*, and get them to come directly here from Mars, as quietly as possible. If they just come look over the whole planet, NORAD *is* going to spot them —and find out that its ABMs don't work any more."

"So what?" several people asked.

"Suppose we resolve this Cockroach situation somehow—but meanwhile the Joint Chiefs find out that all their warheads are worthless. So do the Soviets. Unstable situation. And it leaves the USSR dominating Europe. Finn was right: his scheme only works if the players don't know about it. It's too late to undo the scheme, so we've got to go with it. That means the defense of Earth has to be handled in this room."

That brought a buzz of voices so sharp that it spilled over into the thing that we were building with the other ninety percent of our minds, sending a small ripple of discord through the sonic tapestry, as though there were a printer's error in the sheet music. And then was felt the presence of Lady Sally McGee, a warm, competent, reassuringly strong and calm voice in our heads.

"Lighten up, darlings! This is a party—we're here to usher in the new year! It turns out we'll have to actually *do* something to accomplish that for a change, but there's no reason we can't enjoy ourselves, is there? This could be fun! Now, I think it would be a good idea if all those without concrete useful suggestions were to shut the hell up."

Fast Eddie spoke up in the silence. "De foist t'ing we gotta do is hide Finn."

Even Callahan blinked. "Hide Finn?"

"He's de only card we got—so we slip it up our sleeve. Den we dummy up."

In my head I saw (and therefore everybody saw) a little cartoon, with word balloons and borders and cross-hatching and everything, in which a comic caricature of a cockroach in a pressure suit spoke to Callahan: "*Where is Txffu Mpwfs?*" "Never heard of him." "*An extremely powerful and dangerous scout; he would have fought valiantly.*" "Sorry, haven't seen him." "*Then how is it that you seem to know who* I *am?*" "Oh, I've made a study of lower life forms—"

It did seem like a gambit with some distinct possibilities.

"Eddie, you're a genius," I said. "There's one hitch. Jim, Paul—can you lie telepathically?"

They looked troubled. "We could lie to you; we've got years more experience. To a mind as trained and experienced as ours—possibly. It would be like playing forty-two chess games at once: there's so much to *keep track of* in a telepathic lie. To an alien critter that's never touched a human mind before—" Their eyes met briefly. "—no sweat."

"Maybe," Tommy Janssen said, "we should tell the Roaches we spotted Finn before he got near us and annihilated him—make us look more powerful, like."

Callahan shook his head. "Just wrong, son. That would make us the equals of a Cockroach. We're *superior*—we never even *noticed* Finn. Some little automatic system swept him up and we paid no mind, interstellar invasion didn't even make the papers." He grinned. "Yeah, I think maybe we could pull this off—for

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a few minutes, anyway. We might just put them enough off-balance to find out what we need to know."

Doc Webster spoke for all of us. "You're our spokesman, Mike."

He kept grinning and quoted Lord Buckley again. " 'Well if I ain't, I'm a great big fat groovy pole on a rough hill on the way there.' Okay, while I'm planning the con, you boys hide Finn somewheres."

Gee, that sounds easy, doesn't it? I mean, compared to trying to map out a strategy for outsmarting alien monsters, hiding a guy doesn't sound like a big deal.

A guy who stands damn near seven feet tall and weighs about the same as a Harley-Davidson . . .

The best thought we had was to lay him down on the floor behind the bar, but the Cockroaches might very well burn their way in from above—and besides, Finn *snored*. In three stages.

Then I happened to think of what Finn's physique had always reminded me of. It was a cold January night; we had plenty of coats. What cinched it was that his shirt had two breast pockets that snapped closed: coats hung from that low reached to the floor. When we were done, you could hearly hear the muffled snore; it sounded like a failing fridge compressor somewhere in the next room.

"How do we know the Roaches will hear a telepathic call?" Doc Webster asked worriedly.

"They will," Jim and Paul assured him. "They're not telepaths any more than you folks are, but they'll hear just as you did. We got their 'address-code' from Finn before he went bye-bye."

"Are you sure you can reach them? Last I heard your range was still pretty limited—"

"That was years ago, Doc. And this time we have twice as many minds around to help drive the signal. We're within . . . uh . . . Roach's Limit."

The Doc glared at them. "Obviously you don't understand the gravity of the situation."

Telepathy has its drawbacks. Ordinarily most of us would have missed puns that esoteric.

"All right," Mary said, "by now they've finished checking out Mars and they're shaping orbit for Earth. How do we do this?"

"It breaks down into three parts," her father told her. "Message, target location, and delivery. Me and Jim/Paul'll do the talking. Mary, you and Josie and Joe and Ben and Stan savvy planetary ballistics: you folks aim the beam —you're in charge, darlin', you're the only one of us that's actually been off Earth. Jake, you and the rest of the gang push the message where it's pointed—the way we did back when we first met Jim, get it? Any questions?"

There were none.

"Okay, let's do it."

Our music grew, built, swelled, gathered energy from nameless places and expanded in all directions, churned itself to a mighty crescendo, began to throb and pulse and crackle with contained power. As it did so, vision faded. Reality faded. Physically impossible though it was, suddenly we were all *touching* each other at the same time. I had been to an orgy once, and found it disappointing; this was what I had wanted it to be. It felt like what the

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Sixties had tried, and failed, to be. Like my childhood conception of the Catholic Heaven. Like making love with God.

The last time I'd been on this plane, helping Jim MacDonald to find and reach his lost, tormented, terrified brother Paul, it has been pleasurable, but not nearly this ecstatic. On that occasion, we had all perceived ourselves as standing behind an imaginary truck, stuck in an imaginary ditch, and had put our shoulders and backs into helping get it unstuck. There was no truck now, and whatever was in its place was not stuck—but in some fashion we *strained* now as we had strained then, put all our strength behind a massive, convulsive common effort.

We tried to hide that. Have you ever lifted a very heavy object in front of a stranger you wanted to impress, and tried not merely to lift the crushing weight, but to make it look easy? In just that fashion, we drew figurative breath, fashioned a mighty Shout—and then tried to couch it in quiet, conversational tones, as though we could shout much louder than that if we wanted to.

This time period {*} is a second, we bellowed calmly. **You have thirty of them in which to bargain for your life.**

In the instant that contact was established, we knew just how flimsy our bluff was.

There was only one Master. We didn't even know then just what a break that was. The telepathic aspect of the creature was largely untranslatable, but you might think of it manifesting as a kind of giant space-going shark, a moving appetite, a vast, fast, terrible eating-machine which saw its purpose to be turning everything edible in the universe into shark shit. Like a shark it was implacable, remorseless, unreachable. What made it much more horrible than any shark was that it was highly intelligent and very learned.

This doesn't begin to convey it. The thing was *alien*, and nothing on Terra is as old or cold or deadly as it was. If I'd been alone, I think I'd have snapped like a twig and begged it to kill me quickly. But Mike Callahan was with me, legs planted wide, thumbs hooked over his apron, jaw outthrust challengingly . . . I could see him through my eyelids . . .

It must have known telepathic races in the past; mental contact did not startle it. Its answering "voice" was no "louder" than ours, but it really *was* sending at the low end of its strength—it was much more powerful than we combined were. But it didn't know that—we bluffed it!

"Who are you that a Master should bargain with you for its life?"

"—twenty-nine—" Callahan said for all of us.

"State your asking price."

"One: full and candid disclosure of your purpose and intentions here. Two: your promise not to disturb any sentient in this system. Three: your *immediate departure*. Four: your promise never to return unsummoned."

None of this was in English. That is, it left Callahan's mind as English, but passed through the minds of Jim and Paul, who knew as much of the Masters' language as Finn did, and by hearing it through their "ears," we understood

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it independent of any grammar or vocabulary. The English of it doesn't begin to convey the monstrous arrogance of the bluff Mike was running.

"No Master has *ever* been summoned. I go where I list, and disturb all who perceive me. What—"

"Countdown resumes. Twenty-eight—" Mike interrupted—and a telepathic interruption is ruder than any other kind, I think.

I tried to imagine the situation from the creature's perspective. Humans were sufficiently advanced as a race to be able to hang out a telepathic No Trespassing sign for it, seemed completely unawed by its own majestic power—yet they restricted themselves to a single planet, of a single star system, and the only technology visible thereon seemed primitive. They were either suicidally brave—or they had something up their sleeves. The Masters were, as Finn had told us, remorselessly logical: its safest move was to play along until such time as it determined positively that we were bluffing, and *then* implode our planet, leaving no witnesses to its humiliation.

But it *hated* acknowledging any non-Master life form as an equal, even as a bargaining ploy. Mike got all the way down to twenty-five—and my heart got about three-quarters of the way up my esophagus—when it said:

"It suits me to divulge my purpose here. Subsequently, we may determine together whether its fulfillment will disturb local sentients, and the probable time of my departure."

"Speak. And make it snappy."

"I seek a missing slave. Sent to scout this system, it failed to report back. I seek it, or its remains. Once I have it, I have no further interest in remaining or returning here."

"Goodbye, then. Neither your slave nor its remains is here."

You might reasonably translate the Master's reply as "Sharkshit." It had raised its "voice" slightly: it was getting angry.

We kept our tone level. **"—Twenty-four—"**

When I was a kid in school, I always sat in the back of the classroom. If things got too boring, I'd do a Slow Fade. You move your desk back and to the right imperceptibly slowly, about six inches per minute, toward the back door and out into the hall. If you do it slowly enough, the teacher never notices you leave. In a similar manner, Paul MacDonald began now to withdraw from the thing we had all built in Callahan's Place, without advertising his departure. It helped that his brother's telepathic aspect was so nearly identical to his own. I don't think anyone else noticed—maybe they never played Slow Fade—and I kept my own realization from the common awareness, did my best not to think about it even to myself. While we were talking to the front of the alien's mind, Paul was sneaking around the back . . .

"The slave was well-defended," it was saying. "I can believe you overcame it; but if so it would have been a memorable event."

"Perhaps for one such as you," Callahan agreed. **"Our automatic defenses are capable, and do not require our attention."**

"Then why are you speaking to me?"

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"Amused curiousity. Your mind is singularly ugly."

Oddly, it did not take offense. Every entity it had ever met in its centuries of existence had feared it; it did not know how to react to a direct insult. But it *did* get angrier—because we were wasting its time. **"Even if you had annihilated the slave, there would have been a component left, indestructible by any known force. It would have been located here—"** It sent a sort of three-dimensional X-ray picture of Finn's head, and clearly visible beneath and behind his right ear, between skull and brain, was a little nodule that looked like a marble. **"It is a datafile containing everything perceived by the slave since its last milking. I require it immediately."**

"You grow boring," Callahan said. **"Countdown resumes—"**

"I will tear apart your star!"

Callahan made no reply. He made a throat-cutting gesture to us, and we broke the connection.

There was no chatter. Less than half a minute on the countdown, on our bluff.

"What did you get, Paul?" Callahan snapped, and I became aware for the first time that Paul McDonald was back among us telepathically as well as physically. He tended to "blend in" with Jim's aspect, like an echo, which was why it had been possible for him to get away with a Slow Fade.

He made a convulsive mental effort, and did something like a file memory dump, sending information in a block rather than bit by bit, to all of us at once. In a matter of a second, we knew everything he had learned. Grasping it took me a few seconds more.

I have to put it in figurative terms. A lot of this stuff doesn't go into words; worse, the memories turn insubstantial as I try to translate them. Paul had sneaked in an unguarded back window of the creature's mind, while we occupied it at the front door. He had strolled around in some of the mustier back files of an immense storehouse of memories for a matter of whole seconds, teaching himself how to understand the operating language, the file-finder system, the retrieval commands—reconnoitering while keeping a low profile. He didn't get all he'd hoped for, he ran out of seconds, but Paul was a seasoned professional at tiptoeing through human minds, and he came away with more from this alien mind than I would have believed possible.

The majority of what he learned was incomprehensible or irrelevant or otherwise useless. The creature's name, to pick a basic example, was utterly untranslatable. We could no longer think of it as a Cockroach, and like Mary we refused to call it a Master. We reached an instant group consensus on what to call it: The Beast. (And hoped that we had its number.)

The Beast was a pervert. Don't ask me to describe what kind of pervert it was, or what constituted "normal" for its race. I don't want to think about either one. Please just take my word for it that it was, by its own lights, disgusting. It was *not* ashamed of itself. Shame is a kind of self-hatred, and no Master is capable of hating—or loving—itself. But it did wish strongly that it could be other than it was, and that

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is as close as such a being can come to shame. (Not close enough, in my opinion.)

Its perversion had recently become known to its kind. Social faux pas on a cosmic scale: it was now and forever an outcast, a renegade, to be slain on sight. Its slaves had been reprogrammed to others. It was alone. To one of its race this fate was simply intolerable. Masters cannot live in Coventry. This is weird, since they are not a gregarious race under the best of circumstances. They don't need each other's *attention*, the way humans do, but they positively require each other's *respect*. The Beast had exactly two psychologically feasible alternatives: to suicide, or declare war on its entire race.

In the billion or so years of Master-recorded history, only a very few of the very few outcasts had ever chosen the latter alternative, and their names were metaphoric symbols for evil itself. But The Beast was a *real* pervert.

It was also a logical pervert. No force or combination of forces it knew could seriously threaten its race. But it wasn't (The Beast was prepared, being a pervert, to admit to itself) strictly true that *everything* was known to the Masters. For instance, once in a very long time (even by Master standards), a scout slave failed to report back. Scouts were so heavily armed and defended that it was difficult to imagine anything capable of destroying one before it could get off a report. (No Master in the Universe was permitted to be as heavily armed as a typical scout, since a Master, unlike a slave, could bring himself to turn a weapon on another Master. I know that doesn't make sense in human terms. Very little about the Masters does.) An AWOL scout meant either that someone had destroyed it, someone who could perhaps be used, or that the scout had—incredibly—malfunctioned in some way, in which case its own weaponry might be salvageable.

The risk was horrible. A Master is not defended as well as a scout either.

It was a mad gamble, and The Beast knew it, but it was a pervert and doomed. Desperate and raging, it had followed the trail of Txffu Mpwfs across the big empty spaces to the place where he was known as Mickey Finn, hoping to find some terrorweapon it could use to avenge itself, and found . . . a bunch of barflies, a few time traveling Micks, two telepathic psychiatrists and a talking dog. Callahan's Bar on New Year's Eve.

"All right," Callahan said in our heads as we finished assimilating the burst of largely useless data that included this, "we've got it right where we want it. At T minus ten seconds, we tell it we've changed our minds: we're not going to kill it after all. It's too disgusting to kill. We're going to ignore it—and call the other Masters and demand that they come remove their garbage from our system at once. That should—"

He screamed then, with his mind and with his throat. I don't suppose I'd ever thought to hear Mike Callahan scream. I didn't hear the physical scream, of course, because sounds drown each other out and I and everyone else in the room were screaming too, but mental screams *don't* drown each other out, each one registered with individual clarity. Amazing that I had time to register

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such trivia, with The Beast loose in my brain . . .

"Entropy!"

The Beast was very angry; that was the strongest curse it knew.

"Just as I feared! It was not a weapon which disabled Txffu Mpwfs, but a disease. That 'love' fungus. Useless to me!"

Paul hadn't been as careful as he thought. We should have remembered: Finn thought faster than a human being; so would his Masters. Probably they thought even faster than him.

In the instant of opening communication we had told The Beast the rate at which we processed information—by establishing a second as a significant interval for us—and it had been outthinking us ever since. It had had plenty of time to spot Paul stumbling around in the back of its brain, without alerting him. It had learned a great deal about telepathy from him, and then had hidden in his pocket, as it were, and been brought back home by him. His data-broadcast had opened us all up, allowed The Beast to access our files and study *us*. Our cover was blown sky-high. Jim and Paul MacDonald were effectively dead, their minds torn out, their personalities annihilated, their bodies and brains kept alive to serve The Beast as a telepathic transceiver.

I was caught. Swallowed by The Beast. Damn it, it was *just* like being swallowed by a Beast, the size of the one that got Pinocchio. My surroundings went away, my telepathic companions went away, my eyes and my mind found black nothingness in all directions—I tried to cast around with my arms and discovered that I could not find my body anymore. The audible screams, including my own, were now inaudible; so were the mental ones. There was just the Master and me. All my strings were cut.

"Or perhaps not *entirely* useless after all," it went on thoughtfully. **"I see possibilities . . ."**

I snapped, shrieked at him: "*Mother fucker!*" It seemed to echo.

"It is a minor component of my perversion that I am not. You ought to try to enjoy your consciousness. The one you call Finn will wake, and then I will own it again, and then your consciousness will cease. Soon, as you reckon time: you have no time to waste."

"When Mick wakes up you're gonna be the first Shark that ever got killed by his own Finn!" I only half-believed it, but I badly needed that half. My sanity hung from it.

"I concede that it has disobeyed programming an unprecedented number of times—once, for an interval measurable in your great long seconds." Dimly I knew somehow that the Beast was not talking only to me, but talking privately to each of us, by time-sharing at a horrendous rate, the way a TV tube redraws each line of pixels so quickly that you never see them disappear. **"It will not do so again."**

"Finn loves us!" I cried, while thinking, *Finn loves* one *of us*. "Even if he didn't, he'd fight you—because you're evil!"

"How am I evil?"

"You're a murderer!"

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"Incorrect. I have never killed any sentient entity."

"You and your kind killed Finn's entire race!"

"Incorrect. We have never killed any race."

"Fuck you. Mick told us the truth."

"Correct. You misunderstood it. Its race is not dead, merely in storage. It told you that each of its people has been recorded on a molecule of its own, down to the last memory. All we killed were cells, as you do when you pare your own fingernails. The essence of Finn's people, their consciousness and memories and genetic patterns, are not ended. They could be recreated at any instant, a trivial matter of synthesizing enough protein. They are not dead, merely displaced in time. Like Michael Callahan."

Oof.

"It is a shame that the method he uses to travel in time is unsuitable for Masters—that would be a mighty weapon indeed. I must give thought to adapting it—"

"You're worse than a murderer," I yelled. "You're a *slaver*, and an arrogant pervert!" Dimly it occurred to me that a videotape recording of the interior of Callahan's Place at this moment must look pretty strange: a roomful of people apparently hollering abuse at each other. Or was I actually yelling, with my throat? I tried to figure out how to regain control of my senses, groping around in the dark for the controls.

"Does your race not enslave chimpanzees and dolphins, though they are clearly sentient? And worse, do not members of your species routinely enslave *each other?* This is perverted enough to revolt even me: in all of time, no Master has ever done such a thing."

Damn him, he was getting to me, he kept poking little holes in all my postulates, undermining my moral position and turning my righteous anger into nothing more than the helpless rage of the victim. I tried to ignore him as I struggled to invest my body again.

"Can you, incipient alcoholic who are attracted only to fat women and are comfortable only here in this room with psychological cripples like yourself, call me a pervert? As for arrogance, can you, who killed your family to save a few dollars and show off imaginary mechanical competence, call me arrogant?"

My universe of blackness began spinning around me. Don't ask me how blackness can spin. I had to make it stop or I would go yammering insane, and the only way to do that was to get my eyes open. Damn it, I had lived in this goddam skull all my life, navigated my way around it blind drunk, done a cold-restart of all systems after thousands of interludes of natural or unnatural unconsciousness—why the hell couldn't I tell where anything *was?*

Let's see. The ears should be the simplest; fewer bits of data to integrate than eyes. First get hearing back, then go for the big stuff. Sound off, ears, I can't see you.

"I have nearly reached you now. Soon I will be physically present, and able to restart the slave Finn."

"He'll find a way to beat you. He won't let his wife down!"

There was a sort of far-off rumbling.

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Miles away up its alimentary canal, The Beast was grinning. **"I will promise him that if he helps me to . . . *record* you all, and fights my war for me, I will revive his people, and give them a planet to use as they wish. This one will do admirably. He will cooperate."**

No, damn it, it was *not* a far-away, metaphorical rumbling. It was close by, and real. My hearing was coming back—

—and The Beast was burning his way through the roof of Callahan's Place.

"I will give you a riddle," it went on conversationally. **"There is a race of creatures on this planet which is closely related to my own, though *much degenerated from the pure* stock. A small group of these creatures could easily kill one of you, yet none have ever done so: their worst 'crime' is that, like everything else in your ecosystem, they compete with you for food—and lose in the competition, every time. These creatures are clearly and unmistakably sentient. Yet you slaughter them every time you encounter them, by the vilest means known to you. Can you name these entities? And can you, in light of this information, still consider *me* evil?"**

I heard scattered crashes, felt distant pain, understood that one of my friends had been hurt by a falling piece of burning ceiling.

"I am here," The Beast said. **"Ah—you are even uglier in person than you are in your minds. Strange that ones so awkwardly and precariously constructed could be so courageous. Your attempted bluff was splendid; it might have worked against one as slow-witted as yourselves. I shall treasure your recordings."**

Dear God—how many minutes or seconds could there be left before the mickey finn wore off Mickey Finn and it was all over? Before the whole human race was *stopped*, recorded, frozen like six billion flies in amber for whatever portion of eternity pleased The Beast? Would we ever be revived? If so, would Terra still hold the resources to support technology, the food to support life? Would Sol still burn?

"Now that I am here, there is no need to wait for the slave Finn to *revive naturally. I shall do a system* flush and reboot it manually . . ."

Dimly I heard several voices whimpering, realized that one of them was my own and therefore that my voice was working again.

"Mike!" I screamed. *"Mary! Sally! Help me!"*

And things happened very suddenly then.

Or rather, things had been happening very suddenly, and came to fruition all at once.

The Beast thought very fast, much faster than any of us could hope to, and it had that time-sharing thing down cold. But no one present in the room, including The Beast, knew as much about time as Mike Callahan. Callahan, who carried himself and his wife and daughter through time, without the support of any external hardware . . .

The Beast was carrying on over a hundred conversations at once, like a

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chess Master playing a hundred opponents at once. Every few dozen picoseconds it got back to Mike's "table," and the big Irishman was always there. But in between, he was *elsewhen*, in a quiet, safe space-and-time where he could think things over and plan at his leisure. Leisure enough to work a lot of things out, and to come up with the swiftest and most elegant solution.

He restored our vision.

I saw my friends, and rejoiced. Seeing them, I could hear again in my head the vast thrumming music that we made, feel their support. I saw the far wall of Callahan's Place, the glass-strewn fireplace, flames dancing crazily, whipped by chilly winds that howled in through the space where the ceiling used to be. I knew I was looking at The Beast, we were all triangulating on its signal, but I could not see it anywhere. Was the damned thing invisible?

I blinked, and now I saw it. It had been there all along. Standing proud and arrogant before the fireplace, The Beast, the shark, the Master, the terrible entity tht Mary Finn called a Cockroach.

It was a cockroach. In a little cockroach pressure-suit . . .

The room exploded in laughter, the loudest, merriest belly-laugh that had ever rung the rafters of Callahan's Place, back when the Place had still had rafters . . .

It was about twice the size of the biggest cockroach you've ever seen in your life—unless you live in New York; it would have aroused no comment at all on the Lower East Side. Now I understood the puzzle it had mentioned, and now I understood for the first time humanity's instinctive, unreasoned loathing of *Periplaneta americana*, one of the oldest life forms on Earth. Cockroaches were distant, long-lost cousins of a galactic obscenity . . .

We had to laugh at the true visage of the thing which had so terrified us, terrifying though it genuinely was, and our laughter momentarily undid the creature. For a subjective duration equivalent to that of a trillion-year-old human, it had ruled supreme over all the life forms it had ever encountered. We looked upon its awful majesty and roared and howled and hooted with uncontrollable mirth, and it stood rooted in place for an interval long enough to be perceptible by a human, paralyzed by mortified rage. (Through my head came a line from C.S. Lewis's *Screwtape Letters:* "The devil cannot abide to be mocked.") Its mental control over us snapped and was gone.

In the instant that we saw it, we laughed, and in the instant that we laughed, we stopped fearing it so much, and in the instant that our fear abated, our minds began working again, generating the obvious, logical question:

Why is it talking *so much?*

Why had the damned bug bothered to devote the attention and energy necessary for its time-sharing tour de force, merely to argue with us about the moral merits and deficiencies of our respective positions, insult us, and pose riddles?

It was trying to distract us from something.

Somewhere in our collective awareness were the tools we needed to defeat it. And realizing that much, we now knew what they were.

The solution was drastic, but it was

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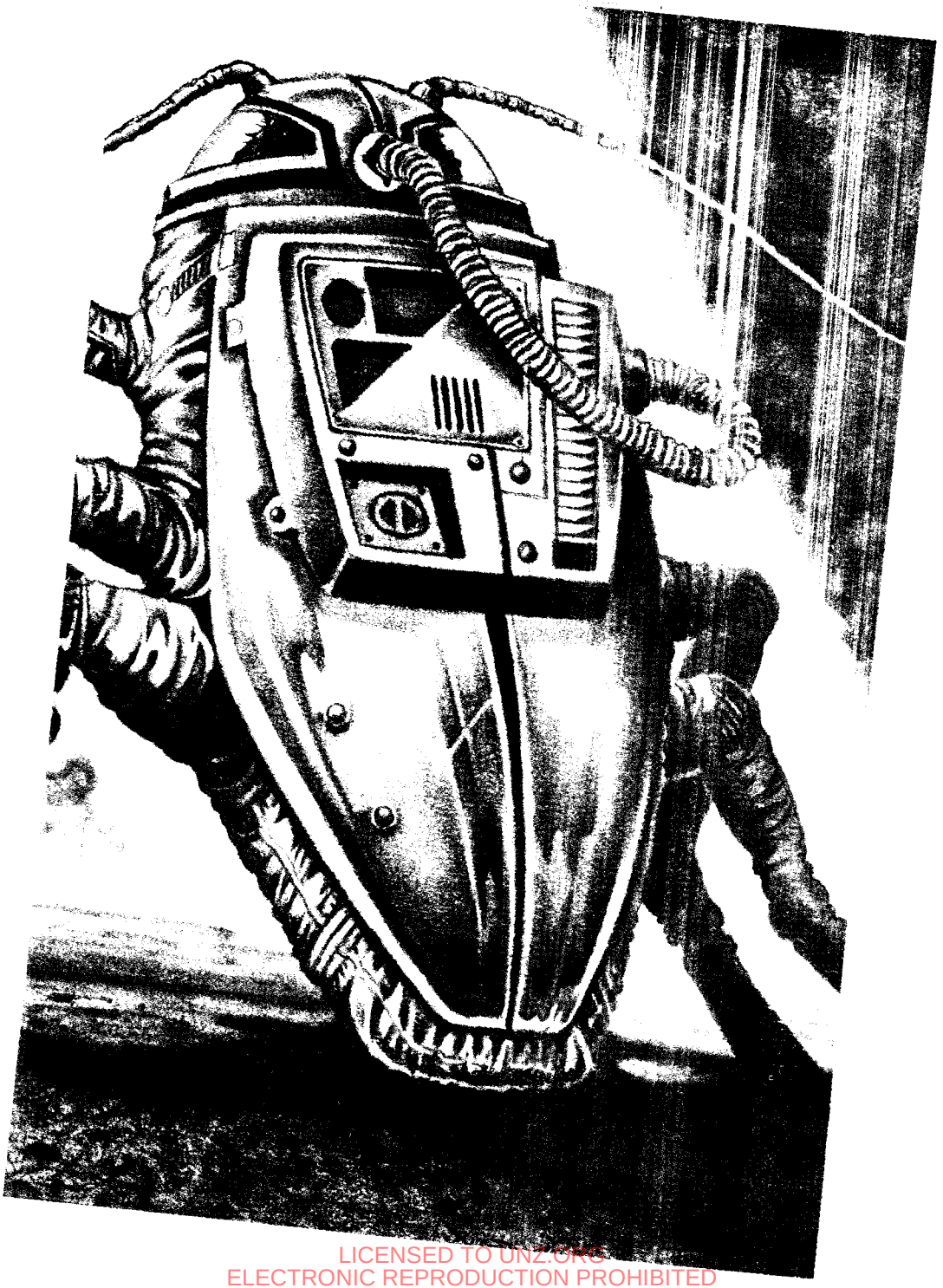

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the only one we had. Nothing good, they say, comes without sacrifice.

It was Noah Webster who had been struck by a falling piece of ceiling; while that had not hurt him, the burning beam had knocked him sideways and then set his arm afire; it was on the rare side of medium rare and quite useless. That made me the nearest effective, and I knew what I needed to do. So did everyone else; as one they moved together and formed a screen between me and The Beast. Except Mary, who grabbed the coat rack and held on, and Callahan, who did the same with his Lady Sally. Our song rose to a final, indescribable hundred-note chorus that rang in my skull and filled my heart with joy. We all closed our eyes.

And I reached into Noah's open airline bag and rolled the fuse-timer back to quadruple-zero.

Invisible hands slapped me, as hard as I've ever been slapped, over every inch of my body at once—including my eardrums, which went dead. At the same time someone kicked the world violently away from me and spun me end over end. My body was rigid as stone, petrified in the act of reaching into the airline bag. Even with my eyes closed I saw bright white light strobe as I rotated. Then I was slapped hard again, principally on the ass, and after a timeless interval I could see and hear and move again.

I sat up and looked around.

I was in deep woods, in the dark, surrounded by shattered branches. The bright white light must still be going on, but it was somewhere else, and the only illumination was feeble moonlight through the branches overhead.

I felt numb. Shellshocked.

Branches rustled nearby. I got to my feet like a very old man made of cornflakes and roofing glue, and followed the sounds. Even before I reached him I knew who it was. I smelled the cigar.

"*Mike!*"

His deep merry chuckle came through the darkness. "Howdy, Jake. Nice work."

"Uh . . . thanks. Where's Sally?"

"Looking around for Mary and Mick. Listen: there's somebody else. *Hey—over here!*"

The newcomer was Noah. "Hey there, Mike. Good thing you had me go back for the bag. Hi, Jake—you did that great!"

"Thanks, Noah. Uh, how's the arm?"

"I'd rather not think about it, if you don't mind." It must be horrid for a man who's already missing a foot to feel his arm broiling . . .

"C'mere," Callahan said. He examined Noah's broiled wing in the darkness somehow, then touched Noah on the shoulder in a complicated way.

"Jesus," Noah exclaimed. "You fixed it, Mike."

"Hell, no—that's just a nerve block. But don't worry—Sal'll fix it up for you as soon as things quiet down a little. C'mon, let's go find her."

"Mike," Noah asked, "how come a nuclear explosion didn't hurt us, but I got my arm burned?"

"Finn specifically protected you folks against blast forces and hard radiation. He never thought to include fire."

"Then why didn't the nuke *burn* us?"

"For the same reason straws got

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blown through brick walls at Hiroshima instead of burning up: they outran the heat."

Jesus Christ. And here I'd been thinking that I was invulnerable. I pictured myself trapped in a wrecked car—unharmed, conscious, and broiling slowly.

The way my wife and child had been . . .

We let Callahan lead us through the woods. Dimly I worked it out that this was the forest to the north of Callahan's Place. "Hey, Noah," I said as we walked, "aren't you going to get in trouble for borrowing that nuke?"

He chuckled in the dark. "Are you kidding? I saved 'em Police Headquarters, and cost 'em a roadside tavern —they'll prob'ly give me a fucking medal."

At the edge of the forest we came upon Lady Sally McGee and her daughter and son-in-law. Mickey Finn was awake now, surrounded by a large pile of coats. Mary, I recalled, had learned from The Beast how to manually revive Mick, something about an override bloodstream-flush—or perhaps he'd simply come out of it naturally. *You just can't get a better alarm clock than an atom bomb,* I thought dizzily. The moment they saw us, Mary came at a gallop, caught me up in her strong blacksmith's arms, and purely kissed the hell out of me. It was at least as disorienting as being at ground-zero had been, but this time only a portion of my body went rigid . . .

"Oh, Jake, you *did it!* You were *beautiful!* My hero!"

I was banjaxed, out for luncheon, voiceless and mindless, for the first time in my life caught without a wisecrack behind which to take refuge.

She turned to her husband, now the most powerful being within several hundred light years. "Mick?"

"Of course, darling."

"Thanks, hon. Meantime, why don't you and Mom and Pop gather up the rest of the family? We'll meet you over there by the big power tower."

"Yes, dear. Jake? Thank you. You have done something I could not have done. You have saved me, and Mary, and all our family. No, do not speak. I know it was mere chance that you were closest, that others here, perhaps all, would have done the same. But it was you who did it. I owe you everything."

He and the others took off vertically, like helicopters, and disappeared into the night. Along with them went all of the coats except for mine and Mary's.

And Mary began to undress me . . .

I am in a position to state categorically that a nuclear explosion at arm's length can be a comparatively trivial event.

". . . Mary?"

"Yes, Jake?"

"This was just like the last time."

She sighed contentedly and snuggled closer under my coat. "Yeah."

"No, I mean . . . that was a kind of goodbye."

"Yes, darling Jake. So was this. Our work is done here. Mom and Pop and I will be leaving soon. We're needed elsewhen. And Mick needs maintenance he can't get in this era."

To my surprise, I was unsurprised, and undismayed. "I thought so. It was

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a great goodbye. They both were. You're never coming back?"

"Never is a long time."

"I'll miss you."

"Thank you. I'll miss you too, Jake. You really are a hero, you know. Triggering a nuclear explosion, on the unsubstantiated word of a time-traveling fat lady that it was safe—that took guts. We only had a second—if you'd frozen up. I would have had to self-destruct Mick . . . and *none* of us could've survived that. Let's join the others, now—it's time."

"Yeah." I found my clothes and put them back on. Perhaps it had been her husband's brand of magic or something from her own time, but it was only when I was fully dressed again that I remembered it was January, and noticed how *cold* it was out here.

As we approached the LILCO power tower around which all my friends were clustered, my attention was seized by the distant fading glow, and the heavy cloud that hung just above it. Contrary to my expectation, it was not mushroom-shaped—the bomb hadn't been big enough—but suddenly I was stopped in my tracks by the realization of what it represented. I'd known all along, of course, but I'd been too disoriented for it to sink in.

"Oh my God, no. Please—*no!*"

Callahan's Place was gone. Not a particle of it was left, not the fireplace or the cigar box or Fast Eddie's piano or Mary's beautiful spiral staircase.

God's golden gonads, *Lady MacBeth had been in there!*

Mary's hand was clutching mine. "Jake, Jake! It's all *right*—truly it is!"

"Oh, Mary, you don't understand! I could stand losing you. I can survive—somehow—without Lady MacBeth. I could even stand a world without Mike Callahan in it. But a world that doesn't have Callahan's Place in it is a world I don't want to live in. I *can't.*"

"Yes, you can."

"No, I can't!"

"Jake, listen to me now. Stop crying and *listen!* I know it's dark, but try to watch my lips."

I tried to stop crying, and watched her lips.

"Jake, dear Jake, you don't need Callahan's Place any more. And I'll tell you why. I *couldn't* tell you before, or you'd have stopped coming to the Place, and Mom and Pop assured me you were going to be necessary. Jake, a lot of things about the past can't be changed, even by us time-travelers. I can't explain why in any terms you'd understand, so you'll just have to take my word for it. But many things we can at least *see*—see them happening, see them *have happened,* call it what you like." She paused and bit her lip.

"So what are you telling me?"

She hesitated, and blurted it out. "Jake, I've seen Barbara and Jessica die!"

"*What?*"

"I thought—there was just—I wanted to see if I couldn't find some way to save them for you. I knew there wasn't any way, but I just had to try—"

In my mind's eye I saw it all again, the little piece of film that I've rerun in my head a million times, the way it must have looked to an outside observer on the scene. The last minutes before the crash are gone from my memory, for-

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ever if God is kind, but I have read the police reconstruction and I have a very good imagination.

The car approaches the intersection at slightly higher than legal speed. The light is just going yellow, and the driver decides to beat it. Barely in time, he sees the sixteen-wheeler approaching the intersection from the left, realizes the trucker has decided to gamble too, and slams on his brakes. He has an instant to congratulate himself on his excellent peripheral vision and superb reflexes, before he realizes that the rear brakes he installed himself the day before are failing and he will not stop in time after all. Then the vehicles collide, and the engine block enters the passenger compartment at an angle, trapping the woman and child who sit beside the driver, drenching them with gasoline. The car spins crazily, trips itself and rolls end over end, comes to rest upright. All three occupants are unconscious, and two of them are on fire . . .

Mary was shaking me by the shoulders, hard enough to crack my neck, shouting something that ended with, "—by the crash, you skinny stupid son of a bitch!"

"Huh?"

"I *said*, the springs the accident report says were found hanging loose in the rear brakes were *snapped* loose by the crash. *It was the front brakes that failed*—I saw it with my own eyes! Did you hear me *that* time?"

I was baffled. "But I didn't put in front brakes, Mary," I said mildly.

"Ah, you did hear me. That's right, dopey, you didn't! The front brakes were done by the dealer who sold you the car."

I snorted. "Come on, Mary—the insurance investigator could never have missed something like that—"

"He missed it for two reasons. One, you were so damned insistent on hogging any guilt there was to be had. And two, he is related by marriage to the car dealer. That's something you can check on, if you don't believe me."

Enough is enough. Even a certified hero such as myself has limitations. I did the only sensible thing: I fainted.

When I woke, all my friends were gathered around me, and I was snug and warm beneath a scavenged tarp. It was still dark, but I made out Doc Webster, and Long-Drink McGonnigle, and Tommy Janssen and Tom Hauptmann and the three Masers and Fast Eddie and the Cheerful Charlies and Ralph Von Wau Wau and all the rest of my family. For a moment there I swear I thought I saw Tom Flannery's ghost.

I felt more peaceful than I ever had in my life.

"It's time, Jake," Fast Eddie said. "Dey're leavin'."

"Sure thing, Eddie," I said. "Help me up."

Callahan and Sally and Mary and Finn were standing by the base of the tower. Josie Bauer was with them.

"Hi, Josie," I said. "You going too?"

"Hell yes," she said. "Us time-travelers have to stick together. I can't wait to find out how Mike's people do it without hardware."

Callahan cleared his throat. "Time to go," he rumbled. "If we get started on hugs and goodbyes we'll all still be here when the universe winds down.

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There's no way, even in my time, to thank you all for all the good times. You know I love you all, so let's just—''

''Just a second, Mike,'' I said.

''Sure, Jake. What is it?''

''Am I correct in guessing that Michael Callahan is not your real name?''

''Of course it is.''

''Well, in this space-time, sure—but I mean, it isn't the name you were born with, is it?''

''Naw. My folks named me after a remote ancestor they admired—except that we don't use last names when I come from, so I only got half his name. But what's the difference, Jake? You told me once you never look at the corpse during a wake, because you prefer remembering folks the way they were when they were alive. This is like that: why would you want to remember me as anything but 'Mike Callahan'?''

''You're right. I guess I was just being nosy.''

Suddenly he grinned. ''Well, I shouldn't indulge you—but I believe I will. Leave you jokers with one last pun, as bad as any you ever laid in my bar. Now I think about it, it's too good to pass up.''

He spat his cigar onto the frozen ground, squared his big broad shoulders, and looked slowly round at all of us. His twinkling gaze rested longest on me and the Doc and the Drink.

''When I was born,'' he said, ''I was known as Justin.''

I blinked. ''You mean,'' I said, ''you were—?'' and then I was laughing too hard to speak.

''You—'' Doc Webster began, and then he lost it too.

Long-Drink McGonnigle never even got out the first syllable; his braying laugh reverberated in the chilly night air like the cackling of a lunatic.

And so it was left to Fast Eddie Costigan to say it.

''Jeez. You wuz Justin, de Mick O' Time.''

And as the night rocked with laughter and cheers, Mike Callahan and his family and Josie vanished. Gone to Harmony, somewhere up the line . . .

Even the greatest rocking, hooting, sidesplitting hundred-person goodbye-and-godspeed laugh has to end sometime, and when it did there was a silence that lasted nearly a full minute. We just stood there in the darkness, not ready to go yet, nothing to say, trying together to integrate the events of the evening. So much to encompass—too much.

Finally Doc Webster cleared his throat. ''Ladies and gentlemen,'' he said in a more subdued voice than usual, ''in the instant before the balloon went up, I did the best I could.'' He held up something that gurgled. ''I clutched this here quart of Bushmill's to my belly, around the side away from the blast, and held on. Fortunately, it seems I landed on my back.'' People started to work up a cheer, but the Doc silenced them with a raised hand and went on. ''I estimate that we could clear a sip apiece, and so I am proposing a toast. I drink to Paul and James MacDonald.'' He took a small sip, and passed the bottle to me. ''Their bodies died when the Beast did. I saw Mick cremate 'em.''

I felt a pang. We all did, I guess. I had mourned the MacDonalds in the moment of their dying, and had not thought of them since. I had come to

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know them impossibly well in an impossibly short time, and I knew all there would ever be to know of them. They had been *good* men, had never once yielded to the temptation to exploit their freak gift for personal gain, had devoted their lives to healing hurt minds, and had fought valiantly on behalf of a race that would probably have torn them to pieces if it had known their secret. Now they were dead, and it had taken us the better part of half an hour to remember them.

"To Paul and Jim," I said, drank, and gave the bottle to Eddie.

It went around the gathering, and every man and woman present toasted and drank, and by the time it reached the last man, Long-Drink McGonnigle, we pretty much all had tears frozen to our faces.

"To the MacDonalds," he said. Then he looked up past the drifting cloud of fallout to the stars and he said, solemnly and most respectfully, "Lord, they deserve a break today."

Those of us who were religious all chorused, "Amen," and those of us who weren't wished, for that moment, that we were.

A few moments of silence. Then a few more. Most of us were poorly dressed for the cold, but no one complained. No one even shivered.

We were all, I knew, thinking back to—Jesus, less than an hour ago!—to long ago and far away in another universe, when we had all, for a timeless but all too short interval, been one. It didn't seem fair, somehow. We'd been on the trembling verge, at the threshold of something for which all the humans who ever lived have yearned in vain all their lives—it would have taken Armageddon to distract us, and sure enough that was what we had gotten.

So we had staved off Armageddon. Now the shining moment was past. The MacDonalds who had married us were dead. The Callahans who had raised us and given us away were gone. The nest, the brightly-lit cave that had contained us, entertained us, and sustained us, was a radioactive hole in the ground.

We were still married. The thing we had forged while in telepathic rapport could not be undone—we knew each other too well, we *had* to be married. But like many newlyweds, we woke feeling oddly like strangers. Like many married people, we had gotten *so* close to one another that we had learned just how far apart we would always be.

I could no longer hear clearly in my head the music we had made . . .

"There'll never be another night like that," Tommy Janssen said wistfully.

Deep inside me somewhere, something that had been under strain for many years suddenly snapped clean through.

"The *hell* you say!"

"Jake," the Doc began, "all the boy means is—"

"I know what he means, Sam. I know what you mean. Do you know what *I* mean?"

I whirled and addressed the group, in a voice that may have been unnecessarily loud.

"All right. We're all locked back up in our personal skulls again. We haven't got a pair of trained telepaths to make it easy for us this time. None of us has whatever genetic mutation made Jim and Paul's telepathic ability so power-

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ful, made it so easy for them to access it—so easy that it nearly killed them before they got it under control, you may recall.

"But we know that we have telepathic ability too.

"We were one, damn it! Even after the MacDonalds died, right up until the instant the bomb went up, we were one. That wasn't the roach doing that, or the inside of my head would feel slimy. Jim and Paul led us to that place, but we were able to stay there without them, for a time at least. Maybe Callahan helped us, maybe Sally and Mary helped us, but we were doing some of it ourselves. The damned roach wasn't a telepath when it got here, but it sure-god learned the trick in less than twenty seconds. I know twenty seconds to it was like twenty years to us—but *I've got twenty years I'm not using*. What about you people?"

"How do you learn to be a telepath, Jake?" Marty Matthias asked.

"Hell, Marty, Callahan's been training us for years! Now we've got to start figuring it out for ourselves, that's all. To approach telepathy, you start with empathy and crank that up as high as you can. You care about each other. You feel each other's joy and pain. You made each other laugh, and help each other cry. You work hard at trusting each other, so that it's safe to dismantle the fortress around your ego. You forgive each other anything that stands between you, and try to bring out each other's best, you work very hard at hosing all the bullshit out of your head so that it's clean enough for visitors, silencing all the demons in your subconscious so that it's quiet enough to hear somebody thinking at you, and most of all you find ways to make that work so much fun that you keep on working. You stick together and love each other and keep growing."

"How do we do that, Jake?" Isham Latimer asked.

"Everybody here makes enough money to get boozed regular, and some of us are flush. I say we pass the hat. Tomorrow night at my place—no, the night after, the banks won't be open tomorrow. Then we take what's in the hat, and we hunt us up a building, a big one back off the road somewhere where you have to look hard to find it, with a good fireplace and an upright piano, and we find out who you bribe to get a liquor license around here, and—"

I'm happy to report that at this point I was drowned out by cheers. A happy pandemonium took place under the stars, people shouting suggestions about buildings they knew, about how to appraise a building, about how the place should be furnished and how to get it done most cheaply. Finally Tom Hauptmann shouted everybody down.

"Hold it, hold it! Brothers and sisters, we're going to need a place big enough to hold at least a hundred—I have the feeling we're going to have a full house pretty regularly from now on. Now, before we get to the logistical problems of all that, there's something I have to get straight. *My feet hurt*. Forty or fifty rummies a night, three or four nights a week, I can handle. But I am *not* going to take over full-time barkeeping. Who is?"

There was no hesitation at all. To my absolute astonishment, at least thirty

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voices chorused, in perfect synch, "Jake, of course."

I turned bright red and stammered. "Why—why me? Why not—"

And paused. Who? The Doc had a practice to maintain. Long-Drink was a bit too slaphappy. Tommy was too young yet. Noah had responsibilities. Ralph couldn't reach the fucking bottles. Eddie was needed at the piano, and Bill Gerrity could never get around fast enough in heels . . .

And while I was riffling the cards and coming up empty, Long-Drink answered the question I'd forgotten I'd asked.

"Because even in the times you were down, you were always the merriest of us, Jake."

And by God, there was a chorus of agreement.

I took a very deep breath, held it until my chest ached, then let it out all at once. "All right," I said. "I ain't a guitar player no more, I've got to do something with my hands. I'm in."

Cheers. "We'll call it 'Jake's Place!' " Tony Telasco yelled.

"Hell no," I yelled back. "We'll call it 'Mary's Place.' "

More cheers—then suddenly silence, as we all heard sirens approaching from both ends of Route 25A in the distance.

"What do we tell them?" Doc Webster asked.

"We'll discuss that together on the way to the highway," I said. "If this crowd can't come up with a suitable Tall Tale, no one can."

The Doc chuckled. "I believe you're right." We all began picking our way across the rough terrain between us and the road.

"Hey, everybody?" Eddie called out softly.

"Yes, Eddie?" I said.

"I know dere's a coupla hours to go yet—but Happy New Year." ■

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the reference library

By Tom Easton

Darkhold, Jerry Earl Brown, Ace, $2.95, 342 pp.

Killer Station, Martin Caidin, Baen Books, $3.50, 384 pp.

Head of State, Richard Hoyt, TOR, $14.95, 306 pp.

Walking on Glass, Iain Banks, Houghton Mifflin, $15.95, 239 pp.

Freedom Beach, James Patrick Kelly and John Kessel, Bluejay, $8.95, 272 pp.

Ancient of Days, Michael Bishop, Arbor House, $16.95, 354 pp.

Angel With the Sword, C.J. Cherryh, DAW, $15.95, 299 pp.

Wanderer, Dennis Schmidt, Ace, $2.95, 202 pp.

Search the Sky, Frederik Pohl and C.M. Kornbluth, Baen Books, $2.95, 245 pp.

After the Flames, Elizabeth Mitchell, ed., Baen Books, $2.95, 288 pp.

Dragonfield and Other Stories, Jane Yolen, Ace, $2.95, 241 pp.

Trinity and Other Stories, Nancy Kress, Bluejay, $15.95, 279 pp.

The Astral Mirror, Ben Bova, TOR, $2.95, 274 pp.

Jerry Earl Brown's **Darkhold** is a rare bird: soft porn SF. Andrew Purrell, a space-age tycoon in his nineties but still youthful thanks to rejuvenation techniques, once had an incestuous relationship with his mother. That rather spoiled his attitude toward sex and women, so when his wife suicided he took a few of her cells and cloned five duplicates to be his sex slaves. We see how he treats them through the eyes of Lilith, the most intelligent and spirited of them all. We see too how he reacts to Lili's constant, inquisitive assertiveness, so like her original, until she pushes him too far and he banishes her from his castled estate, Rockhold. Fortunately, she survives the fate he wishes upon her and goes on to learn her origins, the way the world outside Rockhold regards "created persons,"

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and her own strengths.

The story is well and effectively told, but I can't help but feel that it could have been much more absorbing. The problem may be an excess of introspection, of minutiae, of sexual obsession, and a shortage of active events, a putting off of a sense of context in Purrell's world. Too much of the book could happen now, or a century ago, if we just drop the idea of cloning. Another problem is Brown's reliance on the telepathic link and shared memory credited to clones in too many novels. The concept is intriguing, but it is surely mere wish-fulfillment, and the story could have been much stronger without it.

I've read worse, but not lately. Martin Caidin's **Killer Station** is the stinker of the month, folks. It is sci-fi of the rankest sort, not SF. He should pardon the hyperbole. But consider the evidence: The prose is so studded with clichés and soaked in purple that *one* paragraph can contain the following: "A dawn hurtled across the world . . . new-day birth. The crescent of rainbow hues slashed . . . global-wide (sic) crescent . . . blood-red hue . . . the twilight zone painted a false canvas . . . land . . . still cowered in darkness . . . the velvet back-drop . . . the needle points of starlight in their haphazard splash across infinity . . . two worlds leaped into view, one huddled in its nocturnal blanket and the other awakening to the violent slash of light."

That is trite and hackneyed writing, but it's not the worst. A good writer can survive even so horrible a style, if he (or she) just knows how to tell a story, and Caidin is severely handicapped by his experience with the screen. He stages *every single scene* to wring every last possible drop of cuteness from it. He deluges us with saccharin from the moment the crew of the space station *Pleiades* must tell the world a super solar storm is about to raise hell with civilization to the seduction via massage of Rush Cantrell, station commander, by science chief Christy Gordon. Cuteness ends only when sabotage blows up the station's nuclear reactor and fires its thrusters to bring it out of orbit, aimed straight at Manhattan. Then melodrama takes over, though we never doubt that square-jawed Rush and maiden fair will save the day.

Worse yet—The story starts with life-or-death emergency. Action *must* be taken, now! But the characters keep stopping in the middle of their rush to deliver lengthy lectures on the station, solar weather, Star Wars weaponry, and so on, ad infinitum ad nauseam. And the cuteness sometimes gets in the way of the science, as when Caidin puts canaries in the airlocks as vacuum detectors. And so on, for nearly 400 pages of total muddle and grand-scale hokum.

Do you get the feeling that I disapprove? You're quite right.

Head of State is the first of Richard Hoyt's thrillers I've seen, and it's so good it makes me want more. He has a gift for quirky, colorful, original characters, outrageous plots, and convincing developments. He paints his settings deftly, too, capturing the bleakness of the Soviet landscape so well that he makes me wonder whether he isn't overdoing it. The genre is spy-adventure, but call it political fantasy, admit that it's a good read, and let's say it's SF by courtesy. You too will enjoy it.

Soviet Jew Isaak Ginsburg applies for permission to emigrate to Palestine and is sent to Siberia for his effrontery and his individualism in writing nonstandard poetry. There the camp commandant plays a vicious, unmanning prank on

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him, and he vows revenge. He gets his chance when he meets Estonian Jaan Birk, a human guinea pig in a cancer research lab, who thinks it might be possible to steal the head of Russia's prime icon, Lenin, from its tomb in Red Square, and to ransom it for a year of unrestricted emigration. Isaak makes contact with a smuggler, establishes himself as a true poet, writing just what the State loves, and meets and loves Natalia, artist and abused wife of a bureaucrat. When conditions are ripe, Isaak contacts the CIA and receives a load of necessary equipment from offbeat agent James Burlane.

And they pull it off. But then they must get the head out of the country, despite an intensive search and close surveillance of the prime suspect, Isaak, by KGB Colonel Felix Jin. The story moves with the inevitability of a locomotive, and fittingly enough it culminates with a long ride on the Trans-Siberian Express. Don't miss it, and look for Hoyt's earlier novels, *The Manna Enzyme*, *Trotsky's Run*, and *Cool Runnings*.

Iain Banks is an Englishman, born in Scotland, of whom we haven't seen much before. His first novel, *The Wasp Factory*, was supposedly "brilliantly acclaimed," but I've never heard of it. Now he offers us **Walking on Glass**, and I can see that he may have a brilliant career ahead of him. Granted, he writes in a very British, literary way—slow, introspective, character-focused—not much in step with the norms of contemporary commercial U.S. SF. But he has a fertile imagination, a taste for bizarrities, and the ability to keep even a slow tale moving at an interesting pace.

In *Glass*'s first chapter, Banks gives us Graham Park, a London art student with a friend, Slater, who likes to pose as a homosexual. Slater has introduced Graham to Sara, whose love-life is complicated by an ex-husband and a motorcyclist lover. Graham loves her, though he receives precious little in the way of requition. Sara never invites him into her apartment; sometimes she refuses to answer her door or phone; the most she will give him is a cuddle.

Chapter 2 introduces Steven Grout, a paranoid obsessive of limited intelligence. Believing he has been banished from some interstellar war, he reads SF avidly, seeking a way to go home. His books form a maze of tiered walls across the floor of his rented room. Unable to hold a job, he fancies that "they" are out to get him with plots, microwaves, and hubcap laser beams. He seeks revenge by stealing hood ornaments and putting sugar in motorcycle gas tanks.

Chapter 3 introduces even stranger characters. Quiss and Ajayi really are soldiers banished for blunders from a galactic war to a labyrinthine castle built of fossilized books. Their task is to redeem their fates by playing games, first figuring out the rules. At the end of each game, they get one chance to guess the answer to a hoary riddle: What happens when an irresistible force meets an unmovable object?

Later chapters alternate among these characters. We see Graham's reminiscences and his halting progress toward a rendezvous he hopes will consummate his love. We see Grout's deterioration into madness. We see Quiss's exploration of his castle and Ajayi's discovery of the joys of reading. Eventually, it all comes together, and we see how cleverly Banks has knitted his fragments into a single piece. Ajayi and Quiss will answer their riddle—but only because Park, Slater, Sara, Grout, and Banks himself all belong to the same story.

Glass is a queer book, synchronisti-

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cally coincidental and circularly self-referential. But the ending evokes a laugh, and the whole is quite satisfying. It's worth buying and reading.

Just as queer in its way is **Freedom Beach**, by James Patrick Kelly and John Kessel. It begins as Shaun Reed awakens in an apparent seaside resort with no knowledge of his previous life. There are talking statues, their apparent leader a bronze Balzac, that spell out the rules and a sign that says:

"You came to Freedom Beach voluntarily. Prior to memory editing you understood and agreed to the conditions of your therapy. There are two rules. Please obey them.

You may not harm another guest.

You are forbidden to write."

The other guests are a mysterious lot who play games all day, refuse to think about their fate, and certainly don't write. Shaun is another matter, a questioner and a poor gamer who soon feels compelled to escape, either physically or by writing. He is driven by weird dreams that dole out his missing memory, mixing it with presumably interpretive fantasy sequences. He begins to train for the long swim through shark-infested waters to the islands he can see offshore.

The book's theme seems to be the enigmatic nature of life. *Freedom*'s world is dominated by the dreamers, trios of humans who have taken over politics, education, art, etc., reshaping all toward an efficient, reasonable utopia. Shaun's therapy is "dream therapy" under the aegis of the dreamers. His fellow patients are all people from his past life. Recurring sigils are the pyramids and the sphinx, asker of riddles.

The mysteries do not disappear when Shaun in fact does escape. From the beach he arrives at, to the sphinx in Central Park, the enigmas remain. The answer, the authors seem to be saying, is that our dreamers, our writers especially, should get on with their job. They should dream their dreams for the world. They should *not* escape into the dreams of others, or into therapies of any kind.

And it works. Kelly and Kessel have written a very writerly tale, a dissection of the obstacles any beginning writer faces, of the blocks even experienced writers confront. Like anyone else, they say, the writer must accept his or her own nature, and then get on with the job.

A few years ago, Michael Bishop gave us the marvelous "Her Habiline Husband," in which an example of *Homo habilis* shows up in a Georgia pecan grove and so enchants divorcee and artist Ruth-Claire that she undertakes to civilize him, teaching him sign language and table manners, and finally to marry him. Now we have **Ancient of Days**, the first of whose three parts is that same story. The next two continue Adam's tale as he is given, surgically, the ability to speak, fathers a child and loses it to a mad, racist terrorist, becomes a famous artist, and rediscovers his roots. The narrator, as before, is Paul Loyd, Ruth-Claire's ex-husband, owner of a small gourmet restaurant, and blessed with a curmudgeonly temper from which all his troubles flow.

I'm not at all sure Bishop should have bothered. The tale of Adam's further development and his continued encounters with prejudice is interesting, and so

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is the way Loyd resists his own inevitable development, his progress from curmudgeon to human being. So too is Loyd's encounter with the great god "I AM" at the end. But—it is all anticlimax, and the unlikeliness of the final mysticism destroys our suspension of disbelief at the very moment when we need it most. The story was far more potent when it was only a novella and all the rest lay in the pregnant womb of the unspecified imagination.

Confusing, baffling, frustrating, satisfying. It's a slice of life in a thoroughly imagined, complex world. It's science fiction that will appeal more to fantasy fans, for while its context is a far-future world of interstellar travel and intrigue, its setting is an abandoned backwater where the highest technology is that of gunpowder and gasoline. It's C.J. Cherryh's **Angel With the Sword**.

The world of Merovin was settled as an illicit Union colony. Then its alien owners, the sharrh, showed up, Union stripped its orbital station and removed everyone they could, and the sharrh hunted the holdouts. But some of the holdouts survived, and when the sharrh left, they built civilization anew. At the time of the story, Merovin has over a hundred cities, one of which is Merovingen, a sinking, stinking Venice of canals and bridges and violent plots. Here we meet Altair Jones, teen-aged owner of a skip, a small boat propelled usually by poling or at need by a small motor. She lives by moving cargo through Merovin's canals, until the day a body is thrown off a bridge. Against all custom and wisdom, she retrieves a blond young man, revives him, and falls in love with him. Insistently, she involves herself in his affairs, saves him from a firebombing, rescues him from a slaver's prison, and achieves victory for herself and him. She is as engaging a protagonist as I have seen in SF in years, a confused yet heroic gamine with a promising future ahead of her. Perhaps Cherryh will continue her tale later.

The several maps at the end of the book seem superfluous, but they are symptomatic of Cherryh's attention to detail. She has given her book a strongly real feel. We can see ourselves in Merovin, smell its stench and fear its shadows. This gives her tale considerable power, while the appendices on history and customs add depth of time. Buy it, and enjoy.

The cover of Dennis Schmidt's **Wanderer** is one of the more remarkable botch jobs I have seen. It shows Dunn Jameson, the man whom Earth's ruling tyranny, a religion whose main tenet is that Man is Evil, had sent to assassinate the Way-Farer of the world of Kensho, whose Zen philosophy holds that Man need only discover the Perfection within. Using the power of the Mushin, Dunn has teleported into the flagship of Earth's fleet, sent to destroy Kensho for its heresy. In the story, he simply stands there. On the cover, he floats in mid-air, waving his sword. The artist also depicted the red-headed Dunn as gray and gave him two good hands, though the story clearly states he had lost one hand when he aborted his assassination attempt. Just as bad, though Earth's forces are armed with laser wands that should emit straight beams of light, the artist has them shooting dim lightning bolts.

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It's enough to make you wonder about the mental abilities of artists and art directors. Fortunately, the author deserves no such aspersions. *Wanderer* is the fourth and last of Schmidt's novels about Kensho and its people's adaptations to the Mushin, from the early days when the extra-dimensional mind parasites killed most of the colonists to the finding of a solution in Zen, and then to the discovery that the Mushin offer a means of communication and travel. Here Schmidt reveals the source of the Mushin, in a long-ago effort to trap an extra-dimensional being that backfired, leaving only the monster and the apparatus that confined it to Kensho. We see the Ronin, the loners who murder to feed the Mushin, but who are really but "units in Totality," the single organism of which the Mushin are only manifestations. We see the apparatus of the Mushin trap. And from it all emerges an answer to Earth's threat that, like judo, uses the enemy's strength against him.

Schmidt's theme is the issue of the mass versus the individual. Earth stands for the mass as the state, dependent on absolute control, totally intolerant of heresy. The Mushin represent another sort of mass, the single organism whose parts only appear as individuals. The people of Kenso stand for individualism, with the mass an accident of statistics, but one Kenshoite, Kristina, has found a different Way, embracing the universe as an interactive whole rather than as a collection of monads. Her view is that of a cosmic ecologist, and she is in large part responsible for the solution to the plot's problem. I found Schmidt's interweaving of these threads in his movement toward his climax both impressive and intriguing, and I look forward to his next novel, or series of novels.

In years of late, Frederik Pohl and Kornbluth late have reprised their slate. Sorry. Once more, I just couldn't resist. The point is that Pohl has been going back over the books he and C.M. Kornbluth wrote years ago, revising, recopyrighting, and republishing. Some of those books, like *The Space Merchants*, are satiric classics. Together, they made Pohl's rep as a writer. He has brought a glorious shine to that rep since, all by himself, but he presumably feels some debt to the past. And that's all right.

The latest reprise is **Search the Sky**, in which Pohl and Kornbluth posited the decline of a colonial empire because small populations lose genes. On one world, women come to rule. On another, it's the elders. On still others, the birth rate declines and the marching morons take over. The vehicle of revelation is Ross, a junior trader on Halsey's Planet, where initiative and competence are in short supply. When a longliner, a slower than light starship, arrives with word that several worlds have dropped out of communication, he embarks on a reconnaissance in an ftl scoutship. His discoveries give Pohl and Kornbluth ample opportunity for satire and finally reveal both secret and solution. However, even in revision, Pohl neglects to correct the basic improbability of the premise. Genes are not lost so easily from small populations when they periodically receive new blood such as comes with the longliners, and

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certainly not from populations as large as Earth's 10 billion (in the tale). Even if the poor and the dumb do outbreed the rich and the smart, they retain elite genes in their mass and sexual reproduction will continually throw up new geniuses. Think of it: We all came from the poor and dumb, didn't we?

Elizabeth Mitchell's first anthology of novellas, *Alien Stars*, gave us three original tales. The second volume of the series, **After the Flames**, holds only reprints of after-the-bomb stories. Robert Silverberg's "The Election" is from these pages (1983); it concerns the efforts of the "acting president" of a rebuilding fragment of U.S. civilization to legitimize his leadership with an election, involving every voter within reach. Michael P. Kube-McDowell's "When Winter Ends," from *F&SF*, considers the development and impact of spaceborne time capsules, programmed to descend decades after the war. Norman Spinrad's "World War Last," from *Asimov's*, is a riotous send-up of terrorists, dopers, arms merchants, religious fundamentalists, corpse-stiff Soviet leaders, *und so weiter*. If it fails to fit in the book because it is not really a post-holocaust tale, it does deal with an attempt to start World War III, and it *is* a fun yarn. Enjoy it.

A few columns back, I praised Jane Yolen's *Cards of Grief*. Those of you who picked up the book and were pleased will be delighted to hear of her **Dragonfield and Other Stories**, a collection of 27 fables, fairy tales, and fantasies. Many are short, a few are poems; all are tasty, entertaining items unified by a rare warmth of human understanding. The title story gives us a resourceful maiden and a reluctant hero who must defeat the last dragon with a kite. "Happy Dens, or a Day in the Old Wolves Home" explains the truth, from the wolves' point of view, of the tales of the three pigs, Red Riding Hood, and Peter. "Dream Weaver" is a cycle of tales told by a blind storyteller who weaves dreams on a small handloom and is disappointed that no one ever takes the dreams they have bought for their penny.

These stories originally appeared in *F&SF*, *Asimov's*, *National Storytelling Journal*, *Star*Line*, *The Grecourt Review*, and assorted anthologies and collections, sources so varied that though you may have seen some of the stories, you cannot possibly have seen them all. Make up for that deficiency. Treat yourself to this book. You're bound to enjoy it, and so will your kids.

Nancy Kress's **Trinity and Other Stories** collects eleven yarns from *Asimov's*, *Omni*, *F&SF*, *Universe*, and *Twilight Zone*, but nothing from *Analog*. That strikes me as unfortunate, for it means that you have missed a chance to read some excellent fiction. The reason—I am guessing—has to be that Kress never sent anything to Stan. If she had sent the title story, for instance, I hope he would have grabbed it. "Trinity" offers a successful search for God based in sex, starvation, drugs, and biofeedback, starring a trio of clones, with a twist ending marred only by a touch of bathos. "With the Original Cast" offers a theater based in mental access to past incarnations and shows us the

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problems inherent in meeting, say, the real Joan of Arc on stage. "Borovsky's Hollow Woman" deals with how a sentient spacesuit must protect its soul against human perfidy. And more. All are marked by a depth of imagination unusual even among SF writers, as well as a distinct warmth of human perception. She follows through on her premises most admirably, and I commend her to you.

Ben Bova's **The Astral Mirror** is a collection of 18 essays (two of them on SF) and stories intended as a visionary reflection of the future. It may even succeed for the non-fan reader, but fans will find the book a comfortable array of familiar ideas. There is material here from *Analog*, and from *Omni*, and from elsewhere. My favorite may be the scurrilous "The Secret Life of Henry K," companion to the cockeyed optimism of "The Angel's Gift," which reveals the *real* reason behind Watergate. The previously unpublished "Amorality Tale" presents a delightful obverse of the Lysistratan answer to war. None of the stories may be major artistic triumphs, for Bova is not the kind of writer who makes that kind of impression, but most are competent, thought-provoking entertainment, just as you might expect from a past editor of this magazine. ■

IN MEMORIAM: THE *CHALLENGER* CREW

Analog has often paid posthumous tribute to science fiction writers and artists. Michael Smith, Francis Scobee, Judith Resnik, Ronald McNair, Ellison Onizuka, Christa McAuliffe, and Gregory Jarvis did not write or paint science fiction: they lived it. The tragic flight in which they died was an early chapter in the most important epic in real human history: our species' expansion beyond its cradle planet. Everyone at *Analog* mourns their loss and extends sympathy to their families and colleagues.

There are those who would have the *Challenger* explosion be the end of the story, but that would be consummately bad writing—and the last thing the *Challenger* crew would have wanted. This single mishap is *not* the end; it is merely a "dark moment." Most of the story, and the best of it, still lies ahead. The best monument we can build for the seven who died is to finish that story, and finish it well.

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brass tacks

Dear Dr. Schmidt:

As a reader of *Astounding/Analog* for more than 40 years, with no previous occasion to write a letter, I must register my vehement protest concerning the story "The Road Not Taken" by Eric G. Iverson (according to the title page) and/or Harry Turtledove (according to the index page).

Even the most minimal standards of science-fiction propriety—which this magazine has always exceeded—require some adherence to statistical credibility. Imagination should have free rein, of course; but one-in-a-trillion coincidence as a basic element in a story, without the slightest attempt at rationale for it, is simply unacceptable in a publication of your quality.

In the story in question, the author (whoever it is) tells us that in the year 2039, all five crew members of spacecraft headed for Mars JUST HAPPEN to be descendants of baseball players who were prominent on the New York Giants of the 1910-1930 era: Claude Jonnard (pitcher), Panch Snyder (catcher), Buck Herzog (third base), Fred Lindstrom (third base), and Mel Ott (outfield). The last two are Hall-of-Famers.

To make it worse, the only three members of the army unit confronting aliens to be identified by name are descendants of Brooklyn Dodgers of the 1940-1950 era: Burt Shotton (manager), Billy Cox (third base), and Sandy Amoros (outfield).

In 2039, the population of Earth must exceed 6 billion. How did these groupings occur? And why such a heavy tilt toward third base (where Ott also played frequently)?

Avoiding explanation, or at least acknowledgment, of such odds-defying combinations is intolerable. Please don't let your authors get away with such lax-

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ity—taken for granted in television, film and book publishing—in the future.

LEONARD KOPPETT

Palo Alto, CA

The author replies . . .

Dear Mr. Koppett,

I'm sorry "The Road Not Taken" disturbs you. I've noticed, sadly, that most SF readers aren't baseball fans. I was hoping to amuse those who were, by my choice of names. You, obviously, were not amused.

Why third basemen? God knows—they happened to occur to me. You missed a few of the Dodger names, too. Jim ("Junior") Gilliam is in there. So is Charlie Ebbets, after whom the famous ballpark was named. And Hilda Chester was perhaps the most notoriously vocal fan at Ebbets.

Names aside, how did you like the story?

HARRY TURTLEDOVE

Mr. Koppett later confessed that he did indeed like the story, and his indignant letter was a parody of those he has received in his own work as a newspaperman.

Dear Mr. Schmidt,

I read with great fascination Paul A. Carter's pseudo-article, "The Constitutional Origins of *Westly* v. *Simmons*." My enjoyment, unfortunately, was lessened by some flaws. The first is the hypothetical makeup of the Supreme Court in 1973. Mr. Carter does not account for the fact that William Proxmire, Hubert Humphrey, and Barry Goldwater never earned law degrees in our time-line. They never practiced law, and, consequently, they were never qualified to sit on the Supreme Court.

Another problem is that Mr. Carter does not account for the greatly accelerated career of Spiro Agnew. In 1964 of our time, Agnew was still Baltimore County Executive. His rapid rise (and fall) in our time is phenomenal. I am skeptical, however, that he would have had a parallel career under another set of circumstances.

On the whole, however, I found the article very stimulating. Keep up the good work.

Sincerely yours,

TOM FELLER

The author replies . . .

I appreciate Mr. Feller's comment that three of my hypothetical Supreme Court nominees did not have law degrees and never practiced law, but it does not necessarily follow that they were "never qualified to sit." Nothing in the Constitution specifies the qualifications for membership on the Supreme Court, and preparation for the law in that early era was a good deal more casual than it has since become. The formal legal training of Chief Justice Marshall, for example, consisted of one month at the College of William and Mary while he was being mustered out of the Continental Army after the Revolution.

Since that time all of the professions have become more systematic and formal. But nothing prevents a president from ignoring formal credentials in making a nomination, provided that a majority of the Senate Judiciary Committee concurs. I can easily imagine Richard Nixon deciding that public policy is a more important consideration than proper training. Adlai Stevenson is more of a problem in this regard; but remember that this Adlai is dealing with a Congress where Joe McCarthy is still on the loose. His nomination of Hubert Humphrey—an articulate liberal who nevertheless was an accepted member of the "Senate Club"—is a response to that historical circumstance.

Touché on "the greatly accelerated

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career of Spiro Agnew." To rise directly from county government in Baltimore to the Presidency would indeed be meteoric. But strange and wonderful are the ways of Richard Milhouse Nixon.

I should also say that it gives me great pleasure to have this essay appear in such good company as the cover story and the George R. R. Martin tale.

PAUL A. CARTER

Dear Mr. Schmidt,

As an aspiring writer and long time reader of *Analog*, I enjoyed your Editorial "The Old Refrains." In the first role, I now know the door is open a crack, although a small one. My fondest ambition is to be published in your pages. Being a chicken at heart, I'll wait till I've made it in an easier door first — but, try you I shall.

It is more in the second role, I write this letter. In the thirty-plus years I have been reading Science Fiction, *Astounding/Analog* has consistently been the best. I know this is not an original observation; I wish to express why I believe it to be true. Your editorial, for what it does not say gives the reason. You spent your time talking about ideas and plots as the criteria for choosing a story for publication. You did not spend a great deal of time talking about style and innovative writing techniques.

I believe I speak for a great number of *Analog*'s readers when I opine that I do not read your magazine to experience the latest forms of literary experimentation. While a poorly written piece is something I and you (and your predecessors) shun, writing is not what *Analog* is about. Ideas and stories are.

All of this prattling is in aid of my fond wish that you continue the good work. Your words give me confidence you will.

THOMAS J. IVEANS, III

Placentia, CA

Dear Mr. Schmidt:

Gee, don't you get talking fish stories? We get all the categories you mention in "The Old Refrain," but in our slushpile I do believe that talking fish tales lead all the rest.

Maybe you're just lucky.

ALICE K. TURNER

Fiction Editor

Playboy Magazine

Hmmm . . . this must have some deep, dark significance. Actually, for whatever reason, I get very few talking fish stories—but I did buy one once ("Downeast Encounter," by Thomas A. Easton, June 1980).

Dear Mr. Schmidt:

In reference to your February '85 freedom of speech editorial and Joseph Aspler's rebuttal in the November '85 issue I have the following remarks. First, the fact that Canadian Law has (according to Mr. Aspler) not been abused because it has only been invoked four times in a century isn't significant. Canadian law is patterned after English law and so is the South African law. There seems to be a general consensus in the English Speaking world that the South Africans have abused it. The point is, if the law can be abused by the government, do we want it?

Secondly, those who quote the "fire in a theater" analogy usually neglect mentioning the circumstances of the case. Justice Holmes was writing about the conviction of Eugene Debbs, the labor leader, resulting from his outspoken opposition to U.S. involvement in W.W.I. When a fire exists in a theater what is one to do? Yell "chocolate fudge"? I think a war which slaughters one third of the adult male population of Europe in 5 years constitutes a fire. In fact, Holmes was an Angolphile and

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a member of the Eastern Power Elite. His opinion was hardly objective.

In addition, there existed (and may still exist) a section of British Intelligence specifically aimed at manipulating U.S. foreign policy by controlling the U.S. press. Charles A. Lindberg Jr. (the Lone Eagle) was accused of pro-Nazism for his Isolationist stand in the late Thirties. His father, Congressman Charles A. Lindberg Sr., was given even rougher treatment in 1916. Ambassador Joseph P. Kennedy was also tarred with the Nazi brush by clever British propagandists in the early '40s. I take a dim view of a government which attempts to shut somebody up by calling names. Shame on the West Germans and the Canadians.

In conclusion, I must agree with another Supreme Court Justice (one not known as a civil libertarian): "I am old-fashioned enough to believe that when the framers said no law, they meant no law."

JAMES C. RITTER JR.

Montrose, MI

Dear Stan,

Re your Mid-December editorial, "Do it our Way!" One problem about people with Causes is that they get hung up on terminology. It doesn't matter what you're trying to say; they won't hear you unless you use all the okay-words, the "in" words. Some years ago I participated in a few sessions of a local "encounter group," but I couldn't take the nitpicking. Regardless of what one tried to express, those people jumped on word-choices. "I think," for instance, stopped any communication-attempt cold: "You're not *feeling;* you're thinking" (so that's bad? In that group, it was unforgivable). I lasted quick, there.

On the other hand, as regards sexism which is the example you gave: yes, we may be writing *about* a far future but we're writing *for* today's readers. If a story deliberately depicts a sexist culture, that's the writer's business, and if a firstperson protagonist upholds sexism, the same applies. A more legitimate gripe would be if not only a third-person viewpoint character but also the writer's narrative voice played to the tune of MCP. Thus, when a book I wrote in 1974 was to be reissued ten years later, I went through and in *narrative* voice changed (among other things) "girl" to "young woman" where the distinction applied. It didn't cost me, and maybe it made some readers feel better, so why not?

Let's say, both writers and readers should pay more heed to intent, and less to nitpicking about okay words.

F.M. BUSBY

Dear Dr. Schmidt:

Though I have been reading *ASF (/SF)* since around 1950, this is the first time I have reached the point of actually *writing* a letter to the editor; there is a netherward chute awaiting me paved with the numerous good intentions I've had over the years.

Your editorial "Pendulums" in the September issue provides the stimulus. As a folklorist and historian of literature with a structuralist bent, I have always been interested in ways of perceiving patterns in the historical development of human phenomena, whether on a Spenglerian macro-scale or within the micro-world of an obscure literary genre. The pendulum model is one which both my own experience and my reading of history suggest as having at least general validity, and your attempt at a more rigorous application of the model forced me to reconsider my own ideas about it in two respects.

First, the phenomenon of damping. As I've observed "pendulum swings" in social phenomena over the past couple of decades, I'd evolved and even

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articulated (at parties, never before in print) a "theory of enhanced perception." Let me take the statistics of violent crime as an example. Over the time that reasonably reliable records have been kept, the number of people likely to be victimized by violent crime on any given day, or even in any given year, has remained a very small percentage of the total population, and therefore *changes* in the crime rate are also very small. If last year at this time violent crime affected 10 people per 10,000 population per day, and this year it affects 20, the crime rate has in fact risen by only a tenth of one percent.

However, people do not perceive it that way. Individual and group perceptions, aggravated by the news media, will see it as: "There's *twice* as much violent crime!" If similar statistics continue, such "enhanced perceptions" will grow into a public mood, a trend, and eventually into political and other action. To return to your pendulum model: my "theory of enhanced perceptions" suggests that a society will perceive a small movement of the pendulum as much larger than it really is, and will therefore overreact. This phenomenon, it seems to me, is one of the main factors providing "damping" in the social pendulum.

My other comment relates to your character's query as to "why rationality in human affairs seemed to exist . . . only as a brief transient on the way from one extreme to another." The answer seems inherent in your consideration of the pendulum as "a simple harmonic oscillator;" specifically in the time factor which, while you include it in the equations, you otherwise neglect. You suggest, and I agree, that in real-world pendulum swings moderation, which I take as a rough equivalent of "rationality," lies in the center of the swing rather than at its ends, while extreme (i.e. irrational) behavior lies at the two ends. What you neglect to mention is that a swinging pendulum spends more *time* at the two ends of the swing than it does at the center: indeed, it *stops* momentarily at each extreme, but speeds up as it approaches that rational center and, at the moment of greatest "rationality," is moving at its fastest past that moment. If the pendulum model has any validity at all, it is *inevitable* that "rationality/moderation" is a fleeting and transient mode of social existence.

If one then considers that, according to the pendulum model, a given society spends considerably more time in extreme modes where rate of change is small than it does in moderate central modes where rate of change is high, and adds in my "theory of enhanced perception," one can perhaps see why the pendulum swings rarely diminish significantly in amplitude. This perceptual exaggeration of small social changes takes considerable time to gain effective magnitude: time amply available at the pendulum's extremes. By the time it has exerted its force and the pendulum has started its backward swing, the force, as you rightly note, diminishes. The rate of change increases, but there is progressively less time to react to it until the pendulum has begun to slow as it reaches the other extreme.

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You're quite right about the "brevity of rationality" being implicit in the pendulum model; thanks for bringing it out more explicitly. I also agree that "enhanced perception" affects things, but I suspect it's more likely to increase the effective restoring force than damping—in fact, it might even tend to decrease *damping. Now—can we* compare *present-day oscillations with those in a period when perceptions were less enhanced?* ■

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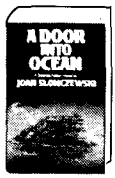

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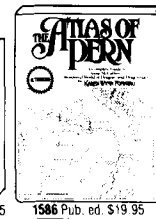

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